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GAS JOURNAL

LIGHT ✦ HEAT ✦ POWER ✦ BYE-PRODUCTS

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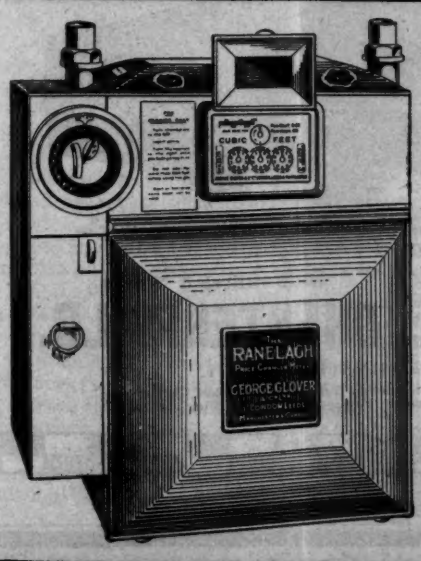

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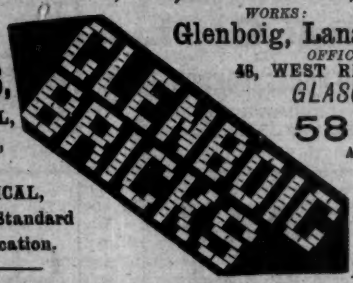

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VOL. CLXI., No. 3118.] WEDNESDAY, FEBRUARY 14, 1923 [75TH YEAR.

EDITORIAL NOTES.

Defects in Gas-Mains and a Conference.

THERE has been a private conference at the Board of Trade, presided over by the Permanent Secretary (Sir Sydney Chapman), to consider various matters connected with the safe distribution and utilization of gas—not that the gas industry is lax in doing everything possible to ensure safety in distribution, but because there has been somewhat considerable prominence given to recent accidents, which have been due not to any inherent faults in the gas-distribution systems, but to outside causes. We hope this point will be kept well in view by the authorities concerned; seeing that this distinctly differentiates these accidents from (let us say) those that are occasioned by electricity, which is responsible for several fatalities chronicled in the annual report on workshops and factories. It is hoped, too, that the authorities will consider the nature of the causes which effect ruptures in gas-mains, and so produce leakages. Further, that they will keep well in mind the proportions of deaths due to pure accident, to carelessness, and to suicide. This is very necessary in order to have in proper perspective the measure of circumspection exercised by gas suppliers in maintaining their distribution systems in good condition. It must also be remembered that it is not, apart from all moral obligation, to the material interest of gas suppliers to have their staple product wasting through defective canalization. That the industry has a splendid record in respect of accidents—judged alone, or relatively with other risks—is attested by the statement made by the Governor of the Gas Light and Coke Company (Mr. D. Milne Watson), at the recent annual meeting of the proprietors, that "the number "of fatal accidents due to escaping gas from mains in the "streets finding its way into houses amounts to a total of "only nineteen during a period of twenty-two years—or less "than one a year in a population of four to five millions." Also that deaths due to gas represent about 2½ per million per annum of the population.

It will be seen from the brief official notice of Thursday's conference that there were several important central and road authorities present, in addition to organizations, among which were the National Gas Council. We are glad that county and urban authorities were represented so well, together with the Ministry of Transport, because they are intimately concerned in the matter of the external causes that have produced accidents. The Roads Board of the Ministry of Transport know—or at any rate Sir Henry Maybury does—that the heavy and fast-moving traffic of these times does not tend to minimize the vibration to which the subsoil of roads and all that resides therein are subject; and the Roads Board are also fully acquainted with the difficulties and heavy costs which modern methods of constructing roadways with concrete foundations, sometimes reinforced, have brought upon gas suppliers, in dealing with the maintenance of their distribution systems, and in tracing leakages. In that constructional work, county and local authorities are mainly interested; and therefore it would be well if they put their heads together with those of the gas industry in an endeavour to find ways and means for dealing with the new problems that have arisen, and which have altogether altered the conditions under which gas suppliers originally did their pipe work.

There were three points under discussion at the conference. They were: (1) The best means of ensuring that gas-mains shall be inspected, and defects made good, when streets are under repair; (2) the steps to be taken to ensure that all escapes of gas of uncertain origin should be immediately reported to the gas undertaking of the district; and (3) the inspection of gas-fittings and the discouragement of the use of dangerous types of apparatus, or apparatus fixed in a dangerous manner. All three matters are highly important. The first subject constitutes common practice, where road authorities work amicably with gas suppliers. As to the second point, gas suppliers cannot be omnipresent; and therefore, unless they are aided by the public, police, or local authorities by the prompt reporting of evidence of an escape caused by influences beyond their control, they cannot be blamed for whatever may happen. As to the inspection of gas-fittings and the discouragement of the use of dangerous types of apparatus, or apparatus fixed in a dangerous manner, gas suppliers are always doing their best to discourage such use. But it is all a question of effective control. Under the Gas Regulation Act, they can, on a change of declared calorific power, adjust consumers' burners so that the gas may be burned with efficiency and safety. But in the case of privately owned installations of piping and apparatus, the majority of gas suppliers have no authority beyond the meter to inspect, prescribe, or refuse to supply. Powers of supervision and prescription, and the right to decline to supply if the fittings are in a dangerous condition, should be in the hands of all gas undertakings. It would add to their work and expenditure; but it would do a great deal to ensure efficiency of supply, and to prevent risks that are often present through the indifferent work and lack of technical knowledge on the part of outside men who profess and call themselves gas-fitters, but are mere jobbers. Where accidents happen, it is more often than not due to the installation of some piece of apparatus by an outside man who is either callous as to the risk that is being introduced, or who knows no better. The utilization of gas covers so many purposes now, and so many types of apparatus, that technical knowledge and skill are very essential; and the qualifications are not always found in the ranks of men employed as gas-fitters by plumbers and house decorators.

However, reverting to the conference, it was agreed that suggestions for dealing with each of the three subjects referred to should be submitted for the consideration and comment of the bodies represented at the conference. We hope that good will come from this—that as one result the powers of gas suppliers will be strengthened, and that road authorities and gas suppliers, recognizing the changes in the circumstances of each other, will do all they can to the scheme their operations to mutual advantage. Perhaps we are hoping for too great an issue from this conference; but the whole subject is important, though the record of the industry is so good in comparison with other risks.

Shall the Industry Change Its Point of View?

THERE are certain marked features about the fuel symposium held under the auspices of the Birmingham and Midland Section of the Society of Chemical Industry, which has been reported in the last two issues of the "JOURNAL," and a further instalment of which is published to-day. The first is that the gas industry has had considerable prominence given to it in the discussions; the second, that the chemists very rightly regard the gas industry as the seat of numerous problems which demand for their elucidation the close collaboration of the chemist and the engineer; and the third, that it is generally considered by chemists that the gas industry will have to, and what is more will, alter its point of

view regarding the production of a smokeless solid fuel of better characteristics than that now known as gas coke. The first feature is not surprising; the second we freely admit; and the third is controversial, but brooks no arbitrary conclusions, for the simple reason that developments are going on apace, and so many unsolved problems are yet with us that anything beyond the immediate future is somewhat nebulous. How well the industry has progressed in the efficiencies and economies of its processes, through development along the old lines, was excellently illustrated by Dr. C. H. Lander and Dr. A. Parker; and how much room there is for the further treatment of our coal supplies on scientific lines in the cause of their conservation and profitable use was shown by both authors. We cannot dismiss from consideration the wasteful use of coal by the domestic fire in connection with the future development of the industry; but we are not disposed to assert categorically that any one of those who pointed to the new-style smokeless fuel line as the one to be pursued by the industry is correct. At the same time, their suggestions are not to be rejected without due exploration; for—who knows?—they may be right. This will show them that the gas industry and its men are not hidebound respecting their existing processes. They are always open to conviction; but they refuse to be swerved by any gust of wind that comes from any quarter. The industry has not found any lack of counsellors in the past few years; but with the capital invested in the industry and the plant that exists, and which to a large extent governs policy and action, no one has yet shown that any absolutely new departure is—at present—going to be to the benefit of the primary business of the industry, and of the customers of its staple product.

Responsible gas men have not been oblivious of the fact that their principal secondary product has not earned for itself a particularly good reputation; and war time and the enlargement of the proportion of inerts in coal have tended further to lower its merits. But there has lately been a change. One of the noticeable features of the gas coal markets, since prices have been reduced from the altitudes which they reached, has been the larger buying of higher grades of coal, with their lower ash content. This fact is bringing about improvement in respect of the ash content of coke; and the moisture is being reduced by the growing use of continuous vertical retorts, or, where water quenching is still the vogue, by better draining. The improvement in the characteristics of gas coke was pointed out by Mr. E. V. Evans, Chief Chemist of the South Metropolitan Gas Company, and by Dr. E. W. Smith. Nevertheless, Mr. Evans believes that to-morrow gas undertakings will not only manufacture gas, but a smokeless fuel, easily ignitable, and containing little ash. Dr. Smith also agrees that the gas industry will realize some time that it will pay it to cease making coke as coke, and to manufacture a product which will be free-burning, and have those other properties demanded by Mr. Edgar C. Evans in a paper which he read, and which is in large part printed in our columns this week. These are observers not only of the trend of affairs within the industry, but outside it. An industry is fortunate that can co-ordinate its practices to external developments and conditions, and so meet public demands as they are presented to it.

Are there external developments and demands at the present time which claim of the gas industry that it shall pay greater heed to this question of the production of an improved smokeless solid fuel? In our opinion, the question can be answered in the affirmative without committing oneself positively to any particular change or line of procedure. The very facts that the gas industry is established throughout the land, has a monopoly of gas supply, and is the only industry that deals with coal on a scientific basis and with the highest efficiency so far attained, are reasons why it cannot be left out of consideration when the question of a national fuel policy is under discussion. "A National Fuel Policy" is the title of the paper by Mr. E. C. Evans; and that policy, according to the author, appears to be largely founded on the production of a smokeless solid fuel. He, too, thinks this should be undertaken by the gas industry; and despite statutory and financial hindrances, and economic conditions, he believes that the industry will in the near future change its point of view in this regard. This will always depend upon the satisfaction of the administrators of the industry that they will be able, by the adoption of new processes and a new policy, to lower the therm price of their staple product. That alone will provide the test of, and govern any decision as to, proposed change. Though secondary products represent a greater proportion of the raw coal used in the industry than the gas produced, we do not think the industry will ever be brought to reverse the position of the primary and the secondary products, so that the latter become the primary ones, and the former the secondary. The idea is that of Mr. E. C. Evans, who encourages belief that, if the industry will only so regard the matter, the cost of gas per therm would be considerably reduced. That is a splendid prospect. But is it merely an *obiter dictum*, or is it a belief founded on deliberate consideration? If the latter, then let us have the details of that consideration. The gas industry is not given to pay much attention to expressions of belief, unless supported by corroborating data, which can be investigated to ascertain their worth.

However, the question is, Is the time ripe for the industry to alter its point of view? This we cannot answer; and it cannot be answered ofthand. To give a reply at once would be going too quickly; and there is danger in that. But this much can be said, that the time is very appropriate for considering whether or not there should be an alteration of the point of view of the industry in the direction so prominently indicated at this fuel symposium.

The Justification and Influence of the Therm.

IF the therm were capable of blushing, it would surely do so now. Reviled and reproached by those who knew no better, it has since had nothing but good said about it. Throughout the recent inquiry, it was defended by all competent to do so, and no one could say that it was wrong in principle, though there were some who wanted the cubic foot to be retained as the basis of charge, pleading that, albeit consumers know as much about the therm as about the cubic foot, custom is a great thing with the British public. If custom is to rule everything, then forsooth we may as well look to a retardation of progress. That might suit the book of obscurants, but it cannot be tolerated by an enlightened people. Over and over again, there has been much talk of the scrapping of our weights and measures, and the adoption of the metric system. There has, however, never been so much clamour over that suggested revolution as there has been regarding the simple therm; but the therm has been fully justified as a measure for charge, seeing that it has the sound base of value actually received. One cannot, of course, with the same accuracy apply to all commodities the principle of charging by value. Yet in a rough-and-ready fashion, the dealers and purveyors of other commodities do make value rule the price, *plus* the measure or the weight. Our tailor, draper, butcher, grocer, and all other tradesmen do it; and why not with greater exactitude in the case of gas. We can go to a tailor's shop, and order two suits of clothes varying as much in price as 100 p.ct.—the difference being in quality. But for all practical purposes a therm supplied in gas is a therm wherever sold; and the volumetric measure is only employed to determine how many therms have been delivered. In this case, the consumer has not to place the same reliance upon the purveyor of therms as he or she has upon his tailor or her draper, who says that the quality of one material has in it a value 50 or 100 p.ct. in excess of that of another. We have there to take on trust, and apply what judgment our lay knowledge permits to, what the tradesman asserts. He may be honest; he may be otherwise. But the case is totally different with the therm. The local authority's gas examiner with his calorimetric equipment, gives the assurance that the calorific power of the gas supplied conforms with the quality declared. The gas industry knows all this; but there is a good reason for pointing it out here—the "JOURNAL" is widely read by interested and influential people who are not of the industry.

The therm is also of inestimable advantage to the consumers. They pay for quality received; the enactment instituting the therm paves the way to more economical manufacture under the conditions of each undertaking; it has cut-out all object in distributing excess inerts; and what is more, the basis of charge being completely uniform, this is influencing competition between gas undertakings in the matter of price charged per therm. No effort will now be spared by one undertaking to keep as close as possible to a neighbour in the price charged. In other days, variable quality served to obfuscate the actual position of things in respect of charges per 1000 c.ft. Of course, as Mr.

William Cash demonstrated to the Departmental Committee the other week, the conditions of even neighbouring companies may make an appreciable difference to the costs of therm production, and therefore to the charge to the consumer. Nevertheless, the very uniformity of the basis of charge to-day is an incentive to get as near to equality in price as is possible. This is a big advantage to the consumer. We see the benefit in London. Never have we known a time when gas has been throughout the Metropolitan area retailed at prices that have such proximity as now in relation to the value delivered. As pointed out in a later paragraph, the South Metropolitan Company are selling at 9d. per therm; Hornsey is doing the same; the Wandsworth, Wimbledon, and Epsom Gas Company are supplying at 9d. in Wandsworth; the Commercial Company are selling at 9⅜d.; the Gas Light Company are coming down to 9·2d. at the end of this quarter, and the Hornsey Company have risen above them all with an announcement that 8½d. will be their charge after the next reading of the meters. These figures disclose a new incentive to add to that of the sliding-scale. The public are learning that the therm is something definite; that the old 1000 c.ft. was a definite measure of an indefinite quality—perhaps not so much in London as beyond. But there will now be a fine and efficacious desire, as we have said, on the part of neighbouring concerns, not to have too large a difference in the price charged for the definite therm. Public knowledge and opinion have to be reckoned with by public utility undertakings. And the Gas Regulation Act has placed in the hands of the public means of knowledge and defence, in relation to gas supply, of a potential value never before possessed.

It is pointed out earlier in this article that the therm has been roundly approved, by men competent to judge, as a rational basis of charge for gas, and many of those men are totally disinterested in the matter. We shall be surprised if the introduction of the therm into the gas industry's business does not in time influence the basis of purchase in respect of other fuel. Coal, coke, fuel oil, and motor spirit may later be brought on to the therm basis; but the last thing the electricity industry would desire to have would be its product retailed by the therm. In No. 1 of Vol. II. of our young contemporary "Fuel in Science and Practice," there is a highly interesting article on "The Therm" by Mr. Allan Greenwell. The article approves of the change that has been made to the therm. There is in the author's opinion no better basis than the calorific power of gas for the purpose of charge; although it is not perfect, it is as perfect as it can be without undue complication. The point of this is that there may be a wide variation in the chemical composition of gas of the same calorific power, and that, as indicated in the report of the Fuel Research Board, the difference in composition may, in domestic heating and lighting appliances, so alter the volume and shape of the flame as to influence the "availability" of the heat developed.

Under the Act, it is only in changes of declared calorific value that gas suppliers have to make adjustments of the burners in consumers' appliances, so as to secure that the gas is burned with efficiency and safety. There is no reference to changes in composition. So Mr. Greenwell proceeds to develop the theory that it may well be that some of the complaints made by consumers of abnormalities in their gas bills since the introduction of the system of charging by the therm are traceable to variation in the composition of the gas supplied without a corresponding adjustment of the burning appliances, because the gas continues to have the same calorific value. As a matter of fact, there has not been a sufficient change in the processes of gas manufacture, and no great departures from the proportion of coal gas to water gas, to make any appreciable differences in the chemical composition of gas in any given area of supply from which the newspaper stimulated complaints emanated. But Mr. Greenwell is not by any means dogmatic as to the importance to be attached to variation in composition with the calorific value constant. He remarks: "It is not easy "to see how this difficulty, *if it is really important*, can be "satisfactorily met, for there is not, and can hardly be, any "compulsory continuous automatic record of the composi- "tion of the gas supplied as there is of its calorific value." "If "it is really important" implies a little uncertainty in the mind of the author. If he will read the various reports of the Gas Investigation Committee of the Institution of Gas Engineers and the Leeds University bearing upon this subject, he will see that, within the power of adjustment of gas and air supply with ordinary burners, quite a substantial change in composition of gas can be effected without materially altering the efficiency. Nevertheless, as we have said, the introduction of the therm as the unit of measurement for the sale of gas is admitted by Mr. Greenwell to be undoubtedly a step in the right direction; and it "provides a "greater elasticity in the gas industry which, if properly "employed, will tend towards national fuel economy." Later on, too, he says: "Although this method [the therm "system] seemed complicated to people who are afraid of "the multiplication table, there is no doubt that it is correct "in principle, and is a definite advance in the science of "salesmanship."

There are other related subjects discussed in the article; but the point of our reference to it is the further independent approval given the therm as the basis of charge for gas.

The Law and Smoke Abatement.

To the "World's Work" series of articles on the subject of smoke abatement, Lord Newton has made a contribution. He deals with the safeguards against smoke, and how to strengthen the law. His Lordship has long shown a great deal of interest in this subject; and as Chairman of the Departmental Committee on Smoke Abatement and Noxious Vapours, he rendered eminent service to the community, which service he has carried into the Legislative Chambers through his persistence in a cause which he knows will, as it succeeds in reducing the infinite harm wrought by smoke, be of incalculable advantage to the country. Although the article is headed "Safeguards "Against Smoke," it is plain from it that the "safeguards" are practically non-existent. In fact, the main part of the article treats of the defects of the present law. It proceeds to tell how (we remember the persuasion that had to be brought to bear before this happened) the Government initiated a Bill, with the laudable object of strengthening the law relating to smoke abatement, but which measure—introduced in an expiring session of an expiring Parliament—Lord Newton modestly describes as having been "inadequate." It was something more than that. It was deplorably weak; and it met with nobody's ideas (other than those who were forced to do something, and so did as little as possible) as to what is requisite to deal with a widely recognized evil. The manufacturers were up against it because, in their opinion, it treated them harshly; seeing that their contribution to the total impurity in the air is only about one-fifth part, while domestic chimneys are responsible for the large remainder. On the other hand, those who are out to do something positively beneficial towards the abatement of atmospheric pollution were disappointed; they want to see real constructive legislation which will make a beginning in limiting the number of chimneys to a house which may emit smoke. In short, the Bill met with general disapproval, and not a small amount of derision. No one mourned its disappearance when the Coalition Government came to an end. What Lord Newton thought of it is shown by his statement that its abandonment was no great loss. In fact, the Bill made little attempt to carry out the recommendations of the Departmental Committee over which he presided, and only amended the unsatisfactory Act of 1875 in such a way as to encourage small confidence in its success.

There were absurdities in the Bill; but, in Lord Newton's view, the principal inadequacy of the measure lay in its failure to deal with the problem of providing for the effective administration of the law. There is ridicule over what was proposed in the way of giving power to the Minister of Health to authorize a county council to carry out the duties of a local authority, should the county council resolve that the local authority had failed to do so. We agree that a county council which would be inclined to complain to the Minister, when the result of such complaint would only cause more trouble for itself, is a phenomenon not likely to appear. As his Lordship says, the administration of the laws against smoke emission must depend not on the mere power of such bodies to take action, but on a duty which should not be evaded. There is only one way to do this; and it is that it should be made the statutory duty of the responsible authorities to prosecute, and the duty of the Ministry of Health to compel if they fail. Another fatal error in the Bill was the omission of any provision for making effective prosecutions possible, by setting-up smoke

standards which can be considered to be reasonable. That suggests immense difficulty. Who would prescribe the standards, and who would determine whether or not they were reasonable? What one individual thought reasonable, another would condemn as being otherwise. The problem is by no means an easy one. However, Lord Newton does not *in toto* condemn the abandoned Bill. It had its good points—such as the provision of powers whereby urban authorities were entitled to make bye-laws with respect to the heating arrangements in new buildings, other than private dwellings. He believes, too, the increase of fines against offenders was a step in the right direction. The inclusion of soot, ash, grit, and gritty particles in the definition of "smoke" was also advantageous. On this point naturally the manufacturers are in complete disagreement with his Lordship. Withal the Bill would have done very little to improve the prospect of smoke abatement, unless important amendments had been incorporated.

The hope of Lord Newton is very generally shared that the new Government will not shirk the duty of bringing in another and a better Bill. But the article does not indicate a desire on his part to deal in any way with the domestic side of the problem. He excepts dwelling-houses, saying it should be the duty of all consumers of raw coal to adopt the best practicable means to prevent smoke emission. This is one essential point with which a new measure should deal; and among others it should be made the duty either of county councils or of newly constituted joint authorities for districts to prosecute for undue smoke emission. It is a big task that he has in mind for the Minister of Health, when he suggests that the occupant of the office should institute standards of what smoke should be considered *primâ facie* unnecessary in various trades and industries, which means standards defining an allowable maximum. In the new Bill, too, the term smoke should include soot and grit. Qualified scientists should also be appointed by the Government to act as inspectors, and to give to the coal consumer advice on smoke prevention, after the manner of the inspectors under the Alkali Works Regulation Act. There is no doubt much unnecessary industrial smoke, which could be avoided by more scientific methods of firing, or the use of the smokeless fuels coke or gas. But as Lord Newton says, the domestic problem remains, and is likely to do so, until the more extended use of gas and "electricity" for heating purposes is prevalent, or until a smokeless fuel can be produced economically on a commercial scale. There is no doubt the domestic smoke problem can only be solved gradually; to attempt to rush it, would be to court disaster owing to impracticability. But we think there would be acceleration of improvement if legislative measures ordained a limitation of the number of smoking chimneys in new dwellings. Such provision would be suggestive in connection with existing houses. Gas undertakings are doing a great deal—more than any other industry—to bring about a purer atmosphere; but their efforts are wholly unaided. A little statutory encouragement for the industry, and stimulation outside it, would do no harm. Lord Newton mentions electricity; it is pretty clear that he does not appreciate the technical and uneconomical facts associated with the provision of electricity for heating. If he did, he would promptly drop further mention of it. However, we are hoping to see, through his efforts and those of other people, an acceptable measure produced which, while not inflicting injustice, will assist in producing that improvement in our atmospheric conditions which is so much desired, and so essential to the national welfare.

To Correspondents.

Notice of several communications which reached us on Monday morning has unfortunately had to be deferred owing to threatened trouble in the printing trade. Due to this it was considered advisable to go to press with this week's "JOURNAL" a day earlier than usual.

Lowest Priced Therm in London.

The little Hornsey Gas Company—"little" in comparison with bulky neighbours—are going to shed another ½d. per therm from the price as from the end of the current quarter; and this is going to give the Company the lead again in the matter of lowest price—8½d.—per therm in London. The South Metropolitan Gas Company are supplying at 9d.; in the Wandsworth area "H.E.J.'s" "little" Company is doing the same, but not in the districts beyond; the Gas Light and Coke Company are coming down to 9·2d. simultaneously with the Hornsey reduction; and the Commercial Gas Company are now supplying at 9⅝d. per therm. The Hornsey Company have a low capital per million cubic feet; and upon this and the price per therm we heartily congratulate the Board of Directors and the Engineer and General Manager (Mr. J. W. Buckley). Their position as a London Company is one of which they and the proprietors may well be proud. And the consumers may regard themselves as fortunate in being supplied by a Company in such a sound financial state, bearing in mind all the repressive influences of the times.

Lighting and Economy.

We have often frankly admitted that the gas industry has been very backward in the matter of scientific lighting; and yet it possesses all the necessary means and brains, if only they were exercised and applied. Where the industry has so largely failed has been in the study of conditions and suitability of units, their position, and accessories. Bad lighting may be either below or in excess of requirement; and there is uneconomy and dissatisfaction in both. We have recently seen the results of experiments which show how, by raising the amount of light given by a miner's lamp, coal output was increased and dirt was reduced. We have also been reading the report of a discussion in the Hastings Town Council which shows the dissatisfaction there is with the lighting of the town owing to the Electricity Committee seeking economy over gas lighting by the utilization of small units of light, with which nobody is pleased, and which add to the work of the police. This is not economy. At the last meeting of the Wales and Monmouthshire Junior Gas Association Mr. E. R. B. French, of Swansea, gave a useful outline of the points to be observed in producing efficient lighting. Nothing more could be done in a paper. The science of lighting is a subject with a very large area. But some people—electric as well as gas—are apt to overlook this, and classify artificial lighting among the rule-of-thumb processes. Hence the prevalent inefficiency, uneconomy, and unsuitability.

Tully and Low-Temperature Plant Combination.

We have not the detailed information yet as to the development; but there have lately been rumours as to an alliance between Tully Gas Plants, Ltd., and the low-temperature people—an alliance on the technical as well as the commercial side. An advertisement in this issue states that "the solution of the carbonizing proposition is the 1923 Tully low-temperature process;" and therein gas of 350 to 700 B.Th.U. is spoken of, and 500 or any desired B.Th.U. guaranteed. The figures suggest that "low-temperature" is hardly a comprehensive designation, as a single process with such productive ability must admit of a good range of working temperatures. This is rather accentuated when we read that the process combines "the latest Tully plant, with carburettor and waste-heat boiler, with the last word in gas fired vertical retort installations." The waste-heat boiler would not be much good working with low temperatures only. However, in due season, we shall have an account of what is being done on the technical side, and thereby receive enlightenment. The scheme, it will be seen, permits of the cost of installation being discharged over a term of years; while the contracting firm will be prepared to market the low-temperature products. Mr. Tully tells us there are great possibilities in this scheme; and we shall look with interest to a fuller description and explanation.

Electricity and Agitations Against Gas.

The "Engineer" has made allusion to the comparative figures cited by Mr. D. Milne Watson, in his speech at the meeting of the Gas Light and Coke Company, as to the fatalities per annum per million of the population from different common risks. Our contemporary deliberately says: "Mr. Watson's argument would perhaps have been strengthened if he had included in it particulars as to fatalities incurred by electric supplies; for behind both the agitation against the therm system, and the outcry against carbon monoxide poisoning, there is suspected by many to lie the not altogether disinterested encouragement of the electric light companies."

The "Secret" of Synthetic Ammonia.

There has been an amount of rubbish in one morning paper lately as to the "betrayal" to the French by the Baden Aniline and Soda Works of the "secret" of the process of manufacturing synthetic ammonia. An agreement is spoken of as to the sale of the secret. But the plain fact is there is no secret to sell; there may be patent rights. The whole chemical world, or at any rate that part of it interested in ammonia, knows the process of manufacturing synthetic ammonia. This is the "Daily Mail" again.

PERSONAL.

The Barrow Town Council have confirmed a recommendation that Mr. W. M. GABBATT be appointed Assistant Gas and Water Works Manager, and that his present salary of £335 per annum (*plus* house, fuel, and light) be increased to £365; and that Mr. G. H. HARDING be appointed Superintendent of the Salthouse Gas-Works, at a commencing salary of £260 per annum. Mr. Gabbatt went to Barrow originally as a draughtsman, and has been in the service of the Corporation for twenty years. He has been Resident Manager of the new Salthouse Gas-Works from their inception.

We are pleased to see that the newly elected President of the British Chamber of Commerce in Belgium is Mr. A. F. P. HAYMAN, who has been resident in that country for many years, and is Chief Engineer and Manager of the Antwerp station of the Imperial Continental Gas Association. Mr. Hayman received his training in the technical office of the Borough Surveyor of Eastbourne, and in the works at Donnington of Messrs. C. & W. Walker. Subsequently he was a Pupil-Engineer at the Lille works of the Imperial Continental Gas Association. After acting as Assistant Engineer at the Association's Haarlem works, he was in charge of their Koekelberg works at Brussels. Then he was an Assistant and Chief Assistant Engineer in Berlin, from which place he was transferred to Antwerp as Chief Assistant Engineer, and later appointed Chief Engineer and Manager.

OBITUARY.

Deep sympathy will be felt, by a wide circle of friends, for Mr. Daniel Irving (for thirty years Engineer of the Bristol Gas Company) in the irreparable loss he has sustained by the death of his wife, Mrs. MARGARET IRVING, who passed away at their residence, No. 2, Priory Road, Clifton, on the 5th inst. Mrs. Irving, who had been ill for some little time, took an active part for many years in religious and social movements, and by her bright personality and enthusiasm greatly endeared herself to her fellow workers. The funeral took place last Friday.

Coal Used for Different Purposes in America.—Under normal conditions, there are annually used in the United States approximately 500 million tons; and the proportions are distributed over the different industries roughly speaking as follows: Steam railways, 28 p.ct.; industries other than steel and coke plants, 28 p.ct.; coke plants (not including gas plants), 17 p.ct.; domestic consumers, 11 p.ct.; electric utilities, 8 p.ct.; steel plants, 7 p.ct.; and coal-gas plants, 1 p.ct. These figures are given by Mr. Egbert Douglas, who says that considerable attention has been given to the important field of using exhaust steam for heating. Another matter of great importance in connection with coal conservation is that of utilizing the waste heat from metallurgical furnaces. By the very nature of the processes, many of these furnaces must waste as much as 80 p.ct. of all the heat in the coal; but a large proportion of this can be recovered by waste-heat boilers.

Creosote Treatment of Sleepers.—During the past seven years, extensive research and investigation work in connection with the preservative treatment of railway sleepers has been carried out in the Forest Products Laboratories of Canada, at the M'Gill University, Montreal. It early became apparent that the ordinary commercial creosoting specifications produce very erratic results; the depth of penetration being usually practically an unknown quantity. All that is definitely known is that the charge of timber in the treating cylinder, as a whole, has absorbed a certain quantity of preservative which amounts to the desired number of pounds per cubic foot, and thus complies with the specification. The current issue of the "Engineer" contains an article by Messrs. W. Kynoch and J. A. Coderre, of the Laboratories, explaining a simple and effective means of obtaining the desired result. Prior to creosoting, incisions of a special character are made in the surface of the sleepers, lengthways with the grain of the wood. The number, depth, and arrangement of these incisions are varied according to the kind of wood to be treated. The sleepers are then creosoted in the ordinary way. Distribution of the preservative, both lengthwise with and across the grain, proceeds from each incision. The length of time of pressure necessary to secure a given depth of penetration in incised timber is much less than that required to obtain the same depth in the same timber not incised. A special machine is employed for making the incisions.

A GAS LEAKAGE CONFERENCE

At the Board of Trade.

A conference, presided over by the Permanent Secretary to the Board of Trade, was held last Thursday at the Offices of the Board of Trade, between representatives of the National Gas Council, the County Councils' Association, the Association of Municipal Corporations, the London County Council, the Corporation of the City of London, the Urban District Councils' Association, the Edinburgh Corporation, the Glasgow Corporation, and the Convention of Royal Burghs in Scotland, together with representatives of the Ministry of Health, the Ministry of Transport, and the Scottish Board of Health, for the purposes of discussing:

(1) The best means of ensuring that gas mains shall be inspected and defects made good when streets are under repair.
(2) The steps to be taken to ensure that all escapes of gas of uncertain origin should be immediately reported to the gas undertaking of the district.
(3) The inspection of gas-fittings and the discouragement of the use of dangerous types of apparatus, or apparatus fixed in a dangerous manner.

It was agreed that suggestions for dealing with each of these questions should be submitted for the consideration of the bodies represented at the conference.

ELECTRICITY SUPPLY MEMORANDA.

THE "Electrical Times" rather frequently says very foolish things about gas. Of course, it does not know any better; if it does, then its performances in this respect are not altogether creditable. When it is exercising itself that way, it also omits to mention matters about both gas and electricity which would put a different complexion on the subject in hand. However, that is its idea of journalism. But all men are not empty-headed; and those who are not, are able to appraise at its proper value what our contemporary says in its rampant periods. It has been commenting on the figures in the recently-issued Board of Trade returns; and it has placed the interpretation upon them that the business of the gas industry is in a state of decline. In coming to this conclusion, it has overlooked some important factors which would have made most men hesitate to adopt a similar view, and especially to give publicity to it. It finds in the returns that the quantity of gas manufactured in Great Britain was 256,977,744,000 c.ft. in 1920, and 249,019,732,000 in 1921. Therefore, the gas industry is on its way downhill. Further evidence of this is found in the fact that in 1921 only 15,775,696 tons of coal were carbonized, compared with 17,566,316 tons in 1920. It has not the figures by it to compare the coke and oil used—the returns only giving the quantities for 1921. Then, again, it has a little sneer at the "small percentage" increase in the number of consumers; the growth in the twelve months having been from 7,448,332 to 7,559,310, or an advance of 110,978. In this, it ignores the tremendous base upon which the percentage is calculated.

Nonsense in the "Electrical Times."

Gas Sales and a Bad Year.

Let us take first the figures of gas sold. Our contemporary makes no reference to the fact that the year 1921 was the one which saw the three months' coal stoppage, and the one which had a phenomenally hot summer. During those three months, consumers were exhorted, and in fact instructed by an Order in Council, to be as sparing as possible in their consumption of gas; and the hot weather aided them in this. To gas undertakings, too, the edict went forth by the Order in Council that water gas was to be made to the fullest extent permitted by available plant, and that only as much coal as was absolutely essential was to be used; and carbonization was to be carried out so as to get from the coal as much gaseous fuel as possible. Is it wonderful in such circumstances—the coal stoppage and the hot weather—that the consumption of both gas and coal in the gas industry receded? We cannot imagine any sane writer on this matter overlooking such important points. The same thing occurred in connection with electricity supply; but the "Electrical Times" says the falling off in the power supply mainly accounted for this, while it jumps to the conclusion that the falling-off in the case of gas was due not to power, but to actual lowered consumption in dwelling-houses and shops. Such foolishness is almost overwhelming. If the writer studies the statistical details, he will find that it was in the industrial areas that gas supply had the greatest decline, and where gas is normally used in the factories not only for power, but for furnace and other heating work. But if he has not time to study the details, he will see in the comparative table that whereas in 1920 the prepayment consumers used 77,911,168,000 c.ft. of gas, in 1921 they burned 80,285,658,000 c.ft. There is no falling-off there. The next column is headed "Ordinary and *Power* Consumers, &c." That was where the recession took place. In 1920, the consump-

tion under that head was 150,562,911,000 c.ft.; in 1921, it was down to 141,768,032,000 c.ft. Now, honestly, does the "Electrical Times" think that industry's use of electricity decreased through trade depression, but its use of gas continued, and therefore the loss to gas was in dwelling-houses and shops? Our contemporary might try to be rational and logical. The reduction in gas consumption was mainly due to the recession of the industrial load, through the same causes that brought about the reduction in the power load of electricity undertakings—undertakings which were glad enough in many cases to have the friendly assistance of gas coke to keep their boiler fires going. Then there is the comment that the increase in gas consumers is at a slower rate than it used to be. At the end of 1921, there were 7,559,310 gas consumers in Great Britain; that number has since risen to close on 8,000,000. If we suppose that each consumer represents a family of five, the 8,000,000 consumers would represent 40,000,000 of the population. Is there anything remarkable about the percentage rate of increase being less now than it was some years ago?

Typical of Gas Progress.

The "Electrical Times" has given ample evidence as to its ability to misinterpret facts, and as to its convenient lapses of memory about influences that caused in 1921 certain effects. But the foolishness does not leave off there. It is confident that gas is losing ground among the bigger houses and premises, and is subsiding among the two and three light people, and even there electricity is dislodging gas. This expression of opinion was made before it was seen what had actually been happening in 1922. The Gas Light and Coke accounts will probably assist our short-sighted contemporary to see that conditions after all are not so bad for the gas industry as it hopes and believes is the case. At the end of 1921, that Company had 854,834 consumers. Since then the number has grown to 884,040; but of the addition 16,766 were taken over from the Ilford Gas Company on amalgamation, so that the net increase is 12,440—this in 1922, the year succeeding the one to which the Board of Trade returns apply. During the year, too, the additional stoves sold and let on hire by the Company—excluding those taken over from the Ilford Company, and any purchased apart from the Company—numbered 64,943. Does this show a decline in the gas business? Furthermore, the output of gas increased during the year by 1,668,073,000 c.ft., or 11,205,935 therms—equivalent approximately to 8 p.ct. But, of course, this is in comparison with the year in which there was a shrinkage of consumption. Even so, the Company's gas sales for last year increased over those of 1920 by 350 million c.ft. This shows the direction of the real popular movement, as well as the inanity of the comments of the "Electrical Times."

The Truth.

But in order that its readers may not think it is merely guided by prejudice when it says "gas is decidedly becoming less popular, and that the downward movement has at last begun," the "Electrical Times" quotes the "Is Gas Obsolete?" article from the "Glasgow Herald," which was criticized in the "JOURNAL" for Jan. 31 [p. 256]. We will not pass over the lines of that criticism again; but it is there for the writer in the "Electrical Times" to read if he wishes to do so. However, there is an interesting letter in the "Glasgow Herald" from Mr. Councillor W. Baxter, of Edinburgh, who is a member of the Corporation Gas and Electricity Committees. He categorically says that for cooking and heating electricity cannot, so far, give anything like the same economic service that can be obtained from gas; and neither can the Editor of the "Glasgow Herald" give proof that gas is more dangerous to life and property than electricity. He recalls that there is in Glasgow at least one all-gas and one all-electricity house. He asks why statistics are not published as to the number of hours fires and cookers in each have been in use, and the cost, also a medical certificate stating whether the health of the occupants of both has been impaired or improved. "It is true," he continues, "that human life can be accidentally and intentionally destroyed by gas; and the same can be said about electricity." At an electricity meeting the previous week, the Committee were informed that claims for £6000 had been intimated for loss of life through being poisoned by fumes from a defective electric cable. The City Firemaster's returns also state that electricity is responsible for considerably more fires than is gas. Statistics of health and death rates of all the city's employees go to prove that gas workers enjoy better health and live longer than do electricity workers; and it is because of such facts that they—the electricity workers—claim a higher wage than the gas workers. The Editor, he says, asserts that Glasgow lags behind in the use of electricity for domestic purposes; but if inquiry be made, it will be found that the domestic use of electricity in the city will compare favourably with any other large city. The use of electricity in the London area for national kitchens has, with one exception, been discarded, and gas reintroduced—the one exception retaining electricity on condition that the cost will be reduced to that of gas, or that the kitchen is to get (say) 3s. 9d. worth of electricity for 10d. If electricity has all the advantages some of its advocates claim, why, asks Mr. Baxter, is it that on inquiry at the Gas Department it is found that, with few exceptions, they are large users of gas for cooking and heating? In fact, the Chairman and Electricity Manager of Edinburgh are supervising an exhibition to demonstrate the economic advantages and utility of electricity for domestic use, while neither uses electricity in his own home for cooking and heating. Enough said. We have not seen this letter in the "Electrical Times."

Reassessments and the Two-Part System.

"Electrical Industries" calls attention to an interesting point that has been raised in Sheffield. Like several other electricity undertakings, the Corporation Electricity Department employ the bi-part system of charging for current for domestic purposes. There is the primary or fixed charge of 10 p.ct. per annum on the net assessment for rateable value, *plus* ½d. per unit consumed. There has been a reassessment of property; and this raises a nice legal point. From the report in our contemporary, it appears that the National Citizens' Union has addressed a letter to the Department, stating that Counsel's opinion is being taken as to the legality of the Electricity Committee in increasing the percentage on the assessment of the consumer's house (presumably the rateable value has been lowered). "We contend," the letter says, "that they have a perfect right to increase the charges for electricity used, but have no power to increase the assessment rate. If Counsel's opinion is in our favour, we intend to take action to recover the charges illegally made." Our contemporary rightly surmises that the issue of this nice point will be watched by consumers wherever the rateable value system is in operation. The matter also raises another question. In the case of a reassessment of a dwelling-house, assuming the rateable value was increased, would the electricity undertaking be entitled to charge the percentage on the new or the old assessment? If the new assessment was lower than the old one, no doubt the consumers would claim that the 10 p.ct. should be based on it; but what would happen where "the boot was on the other leg." Without expressing any positive opinion, offhand we should say that the contract between the Department and the consumer, in the event of a change in the assessment either way, should be on the old assessment—otherwise there would be a variation of the contract, and, assuming the assessment was raised, the price of the current would be increased without any apparent justification. Then the position of a new consumer on the rateable value system is another question. Assuming two houses which have had their assessments raised—the occupier of one having been a consumer before the assessment was increased, and paying the percentage on the old assessment; would his neighbour, who became a consumer after the reassessment, pay on the new rateable value?

Light Cheese-paring at Hastings.

The Hastings Electricity Committee are continuing their policy of attrition against the gas lighting of the streets. At nearly every meeting of the Council, there comes along a resolution from the Committee to lay a fresh short length of cable, and to convert street lamps to electricity. The Council have meekly consented; but at last there is rebellion. The Council have hitherto been silent over a widely recognized fact—that the Electricity Committee have been putting in small units of light, which make their presence observable only by the twinkle in the surrounding gloom. Another instalment of the attrition policy was introduced at the meeting on the 2nd inst., and some members took the opportunity of speaking their minds. Alderman Smith had first shot, when sanction was sought to an application for a loan of £2929. He said frankly it was better to leave the gas-lamps as they were than to put in paltry and inadequate lights such as the Electricity Committee are giving them. The "front line," in his opinion, leaves much to be desired; and the streets are "hopelessly inadequately lighted." He protested, too, against the "pimple" of a light that had been placed on the street refuge at the Memorial. Another speaker—Alderman Dighton—described the lighting at the street refuge as "scandalous;" and another occupant of the aldermanic bench—Alderman Cox—asserted that the whole of the lighting needs reconsidering. However, the proposal of the Committee was accepted. But later on in the meeting, they got another dressing-down; and in the course of it, the view was freely expressed that the lighting was not equal in amount to pre-war gas lighting. The discussion was raised on a motion by Mr. Councillor Tingle—"that having regard to the defective street lighting in the borough, it be an instruction to the Public Lighting Committee to revert to the pre-war system of street lighting throughout the borough." There were several speakers—all condemning the present electric lighting. Among them was Alderman Fellows, who declared that, though money was being spent left and right, the town sent visitors away at night in semi-darkness. In the reference to the "pre-war system," certain members saw the possibility of being committed to a return from their own to the old "shop." And so Mr. Hill suggested that the motion should be amended to "a return to the pre-war amount of illumination." He, however, agreed as to the inadequacy; and he told how the police had a very difficult duty to perform in the half light. It was the hope of Alderman Smith that alterations would be made at once, and that some improvement would be effected on the front. Before the war, Hastings was the best lighted seaside resort; now it is the worst. The Mayor (Alderman Mitchell) moved the amendment suggested by Mr. Hill; and in this form the resolution was adopted. So the Electricity Committee are no longer to palm-off an inferior light on the ratepayers. They have to get

up to the pre-war standard, otherwise they will have no rest now that the ball has been set rolling for improvement.

Light and Production.

The effect of a good light on production is well illustrated in a contribution by Messrs. Farmer, Adams, & Stephenson, to the "Journal of the National Institute of Industrial Psychology." The great difficulty in increasing the candle power of miners' lamps is the extra weight which is necessary to provide an accumulator of adequate capacity; but the investigators named secured volunteers to use a special lamp, which, while giving a light approximating six times the intensity of that of the standard lamp, is approximately five times as heavy. The men entered into the investigation with spirit. Volunteers were readily forthcoming; and one man carried his heavier lamp to the coal face for eight weeks. His output and dirt deduction for the eight-week period has been compared with those for an eight-week period before the use of the lamp. The average output of coal per man per shift before the use of the big lamp was 2·47 tons; during the use of the big lamp, 2·83 tons—an increase of 0·36 ton, or 14·57 p.ct. The deductions for dirt were: Before the use of the big lamp, 16 tons; during the use of the big lamp, 12 tons 10 cwt. Hence there was a reduction of 3·5 tons in the amount of dirt, or no less than 21·87 p.ct. On reverting to the standard lamp, during a further period of eight weeks, the output declined to 2·57 tons—a decrease of 0·26 ton (9·2 p.ct.); and the deductions for dirt went up to 18 tons 9 cwt.—an increase of 5·95 tons, or 47·6 p.ct.; the deductions for dirt during the use of the big lamp having been 12 tons 10 cwt. The corresponding figures for the groups of men on each side of the test group showed a fluctuation of only 1 p.ct., which served to indicate that the improvements obtained with the test group were not attributable to factors other than that of better illumination.

London Electricity Problem.

The London Electricity Supply Bill, promoted by the London Electricity Joint Committee (nine Electricity Supply Companies being members) is to be opposed by the London County Council. In the preamble to the Bill, the Joint Company state that "the local authorities and the Company have resolved that the development of the supply would be best effected by the formation of a body representative of the local authorities for that part of London and the neighbouring areas now supplied by local authorities, and by the centralization of the generation of electricity therefor in the hands of such body, and by the centralization in the hands of a body representing the London Electricity Supply Companies of the generation of electricity for the supply of the part of London and adjacent areas now supplied by such Companies." The London County Council Special Committee on Electricity Supply see in the scheme a proposal to exclude the operations of the new Company from any control or supervision by any Joint Authority that may be set up under the Electricity Supply Act of 1919. Throughout the piece, the County Council have made it clear that they will not be prepared to part with any powers reposed in them as trustees for the public except upon the condition that a Joint Electricity Authority is established on lines which will secure that the generation of electricity is regarded as a whole throughout the entire area, and which adequately protect the rights of the public *quâ* consumers, and the rights of the ratepayers *quâ* potential purchasers of the undertakings. It is thought that the net effect of the Joint Company's measure would be to isolate the areas of the Company undertakings, and to postpone public control in those areas from 1931 to 1971. The Council regard the scheme as dealing with only one side of the London problem. On these and other grounds, they therefore decided to oppose the measure. Everybody concerned knows that the London electricity problem is a difficult one to solve, and that the interests are so antagonistic that there is no chance of getting a general movement to one goal, without there is a measure of compulsion.

COMMERCIAL GAS COMPANY.

Annual Report and Accounts.

THE following is the report for the year ended Dec. 31 last which the Directors of the Commercial Gas Company will present at the meeting of shareholders on Thursday, the 22nd inst.

The revenue account shows a profit for the year of £173,999 18s. 10d., which, added to the balance of £24,929 18s. 10d. brought forward from the previous year, amounts to £198,929 17s. 8d. After providing for the payment of dividend for the June half year at the rates of £5 12s. p.ct. per annum on the 4 p.ct. stock and £5 10s. p.ct. per annum on the 3½ p.ct. stock, and for the debenture and other interest, there remains a balance of £117,701 15s. 8d. available for dividend in respect of the December half year.

The Directors recommend the payment of dividends thereout at the rate of £6 p.ct. per annum on both the 4 p.ct. stock and the 3½ p.ct. stock, less income-tax, which with the dividends paid for the first half of the year, will average for the full year £5 16s. p.ct. per annum on the 4 p.ct. stock and £5 15s. p.ct. per annum on the 3½ p.ct. stock.

During the year 1922 the Directors made three reductions in the price of gas: 2d. per therm in January; 1d. per therm in April; and 2d. per therm in July. They have now made a further reduction as from Jan. 1, 1923, of ⅝d. per therm, equalling nearly 2d. per 1000 c.ft., making the present price of gas 9⅜d. per therm, or 3s. 9⅜d. per 1000 c.ft.

Messrs. W. G. Bradshaw, C.B.E., and R. Y. Bevan and the Rt. Hon. Lord Marshall, P.C., K.C.V.O., three of the Directors, retire by rotation, and, being eligible, offer themselves for re-election.

Mr. G. W. Ilsley, one of the Auditors, will go out of office by rotation, and, being eligible, offers himself for re-election.

WILLIAM GRAHAM BRADSHAW, *Chairman.*

Gas-Works Stepney, Jan. 25, 1923.

The Accounts.

The accounts accompanying the report consist of the usual set of statements. They show that the paid-up stock on Dec. 31 last amounted to £996,405; that £1,076,875 had been added by conversion, making £2,073,280; and that £254,298 remained unissued out of the total authorized capital (including premiums) of £2,340,000. The total amount borrowed at this date was £339,062 10s., and £135,937 10s. was added by conversion, making a total of £475,000, and leaving £114,226 to be borrowed, out of the £585,000 authorized. The capital account receipts amount, with premiums, to £2,606,065. The expenditure stands at £1,522,815, with a nominal amount of £1,212,812 added by conversion—together £2,735,627. There is thus a balance of £129,562 carried to the balance-sheet. A sum of £62 was during the year expended on freehold land; £11,211 on new and additional buildings and plant; £2107 on new and additional mains and services; and £2126 on new and additional steamships. But £3912 is credited for stoves and prepayment meters and fittings. The reserve fund amounted at the close of the year to £52,234, and the insurance fund to £31,756.

The following is the revenue account:

Receipts.			
Sale of gas—			
Per meter (number in use, 116,416) at 1s. 1d., 1s., and 10d. per therm	£754,556 10 0		
Public lighting and under contracts	27,264 3 3		
		£781,820	13 3
Rental—			
Meters (26,850)	£9,277 0 0		
Stoves (93,605)	35,364 0 5		
Prepayment meters and fittings (88,990)	43,778 4 6		
Maintenance of mantles and fittings	2,248 3 11		
		90,667	8 10
Residual products—			
Coke	£174,763 11 7		
Breeze	3,373 3 2		
Tar	43,195 10 1		
Ammoniacal liquor and sulphate of ammonia	33,211 14 11		
		254,544	0 7
Miscellaneous receipts—			
Rent receivable	£443 0 8		
Transfer fees	78 0 0		
		521	0 8
Total receipts		£1,127,553	3 4
Expenditure.			
Manufacture of gas—			
Coal and oil, including dues, carriage, unloading, and trimming	£432,657 14 11		
Salaries of engineer and officers at works	14,378 10 0		
Wages (carbonizing)	44,503 7 1		
Purification, including labour	7,724 12 2		
Repair and maintenance of works and plant, materials and labour (less £1110 18s. 9d. received for old materials)	147,614 13 11		
		£646,879	4 1
Profit sharing		15,223	10 3
Distribution of gas—			
Salaries and wages of officers (including rental clerks)	£31,874 17 2		
Repair, maintenance, and renewal of mains and services, material and labour	35,169 15 5		
Repair and renewal of meters	13,512 14 3		
" " " " stoves	42,578 5 5		
" " " " prepayment meters and fittings	40,735 17 11		
Maintenance of mantles and fittings	3,228 16 6		
		167,100	6 8
Public lamps—lighting and repairing		10,288	6 5
Rent, rates, and taxes		38,608	7 3
Management—			
Directors' allowance	£4,750 0 0		
Company's Auditors	150 0 0		
Salaries of Secretary, Accountant, and clerks	5,659 9 0		
Collectors' salaries and commission	6,193 19 5		
Prepayment meter collection	18,955 8 3		
Stationery and printing	3,843 16 3		
General charges	8,168 6 11		
		47,720	19 10
Bad debts		1,489	6 6
Law and parliamentary charges		719	19 4
Superannuations and Allowances, and Workmen's Benefit Society, &c.		19,890	17 0
Official officers, &c.		742	19 5
National Health and Unemployment Insurance		4,689	7 9
Total expenditure		£953,553	4 6
Balance carried to net revenue account		173,999	18 10
		£1,127,553	3 4

Total wages paid in 1913, £119,010
" " 1922, £285,875
Total salaries paid in 1913, £22,976
" " 1922, £66,271

Statement of Coal and Oil.

—	In Store Dec. 31, 1921.	Received During Year.	Carbonized During Year.	Used and Sold During Year.	In Store Dec. 31, 1922.
Coal—tons . .	31,712	241,814	239,731	737	33,058
Oil—gallons . .	340,781	984,821	652,536	..	673,066

Statement of Residual Products.

Description.	In Store Dec. 31, 1921.	Made During Year.	Used During Year.	Sold During Year.	In Store Dec. 31, 1922.
Coke—tons	3,237	161,818	25,671	133,619	5,765
Breeze—tons.	1,995	16,202	..	16,615	1,582
Tar—gallons.	490,396	2,401,158	..	2,465,883	425,671
Ammoniacal liquor—butts of 108 gallons	9,836	85,738	80,544	..	15,030
Sulphate of ammonia—tons	170	2,639	..	2,587	222

Statement of Gas Made, Sold, &c.

Quantity Made.	Quantity Sold.		Quantity Accounted for.	Number of Public Lights.
	Public Lights and under Contracts (estimated).	Private Lights, per Meter.		
Therms. 18,744,697	Therms. 332,201	Therms. 16,721,924	Therms. 17,335,291	3603

The last statement is the balance-sheet, which gives the value of the stores in hand at the close of the year, as follows: Coal, oil, &c., £56,737; coke and breeze, £5947; tar, ammoniacal liquor, sulphate of ammonia, &c., £15,536; sundry stores, £57,818—total, £136,040. The figures this time last year were: Coal, oil, &c., £74,610; coke and breeze, £5002; tar, ammoniacal liquor and products, sulphate of ammonia, &c., £17,067; sundry stores, £65,094—total, £161,774.

MANCHESTER DISTRICT BRITISH COMMERCIAL GAS SALESMEN'S CIRCLE.

The Inaugural Meeting of the West Riding of Yorkshire Section of this Circle was held at Bradford on Feb. 1. Representatives from the various undertakings in the district met to discuss matters relative to the formation of the Circle. The chair was taken by Mr. Ernest J. Sutcliffe (Deputy Engineer and Manager, Bradford), who conveyed a message from Mr. Charles Wood (the Engineer and Manager of the Bradford Corporation Gas Department) assuring the Circle of his, and the Gas Committee's, hearty support.

Rules were submitted and approved by the meeting, on the general lines of those adopted by similar Circles. The first meeting of the Circle was arranged to be held at the Bradford showrooms on Feb. 28.

After the business meeting, Mr. W. M. Mason (Manager of the British Commercial Gas Association) gave a comprehensive address on the ethics of salesmanship, for which he was heartily thanked, on the proposition of Mr. S. H. Packer (Bradford), seconded by Mr. E. L. Houghton (Huddersfield).

A fuller report of the proceedings will appear in the next issue of the "Gas Salesman."

"Proceedings" of the Société Technique.

We acknowledge with thanks the receipt of the 1922 "Congress Proceedings" of the Société Technique de l'Industrie du Gaz en France. The book is handsomely bound, as usual, and contains 705 pages and numerous illustrations. The Congress last year was held in Paris, and was notable for the number of excellent technical contributions, which covered every sphere of the industry's activities. Most of the contributions were translated in abstract for the "JOURNAL," and appeared in our columns from time to time. The Congress terminated with a visit of the members to London and a trip to the battlefields of Belgium. The former coincided with the annual meeting of the Institution of Gas Engineers; and the opportunity was taken of offering the Société a hearty welcome. That this was appreciated, and that considerable value was placed on the visits arranged for them to the Fuel Research Station, to Beckton, and to the East Greenwich works of the South Metropolitan Gas Company, is evidenced by the full report of the luncheons and visits which is given in the Proceedings; and their visit is perpetuated by the inclusion of many photographs and of portraits of our own leaders in the industry.

Manchester and District Junior Gas Association.—A visit has been arranged to the Darwen Gas-Works next Saturday afternoon. The inspection will be followed by tea, on the invitation of the Gas Committee, and then, in the Council House, Mr. H. Chaloner, of Messrs. J. E. Williams and Co., Ltd., will read a paper entitled "Suitability of Oils and Paints for Gas-Works Purposes."

REMOVAL OF NAPHTHALENE FROM GAS.

There was a meeting of the Newcastle Section of the Society of Chemical Industry on Jan. 31, at which Mr. B. RICHARDSON, of the Tynemouth Gas Company, read a paper on "Naphthalene in Coal Gas and Its Removal."

It was pointed out by the author that 10 grains of naphthalene crystals could completely choke a ½-in. pipe for a length of nearly a foot. He considered that vertical retorts produced considerably less naphthalene than horizontals. It had also been observed that when excessive volumes of inert gases were drawn into retorts by leaks, &c., naphthalene invariably made its appearance in increasing quantities; the presence of nitrogen evidently favouring its formation. The type of coal used for gas making was also a determining factor in the production of naphthalene; Durham coals being held to yield more than coals from Lancashire or Derbyshire seams.

Reviewing methods of elimination, he said that the most efficient and reliable means to adopt was to remove the naphthalene from the gas by treatment with a solvent which might be naphthalene-free creosote, anthracene oil, or oil employed for carburetting water gas. Water-gas tar had been used; but he did not recommend it. Whatever solvent might be employed, prolonged and intimate contact must be effected between it and the gas. The most efficient type of apparatus was a mechanical rotary washer-scrubber, through which the solvent and gas travelled in counter-current fashion.

It was practically impossible to effect complete removal by bubbling the gas through an oil-seal in a Livesey type of washer. The contact time was so short that the efficiency of extraction was extremely low. Tests carried out on an installation of this description showed that at no time was the efficiency of removal greater than 56 p.ct., and it was frequently below 10 p.ct. when the oil used was not more than half saturated with naphthalene. Creosote oil had proved itself an excellent medium, and even war-time benzole plants were being successfully employed. Anthracene oil had a disadvantage in tending to solidify, and so to cause excessive back-pressure. Undertakings possessing water-gas installations might profitably make use of the carburetting oil to serve as both naphthalene extractor and enriching agent.

This method had been employed with success for over six months in the works at which the author was employed. The gas was treated in an eight-compartment rotary brush-scrubber with gas oil—a heavy petroleum—travelling in a direction counter to the gas, so that efficient scrubbing was assured. The oil usually employed was a Mexican variety of 0·865 sp. gr.; but an American oil of a similar nature was also successfully used. Tests showed that there was little or no deterioration in quality through the removal of useful hydrocarbon vapours. At their works, only the coal gas was dealt with for complete removal of naphthalene; the water gas entering the holder without treatment. The mixed gas at the present time contained from 0·5 to 1 grain of naphthalene per 100 c.ft.; and if it were possible to wash the total make, complete elimination would be brought about. He was permitted to state that the net cost of the process worked-out at about 0·33d. per 10,000 c.ft. of gas.

DISCUSSION.

Dr. W. B. DAVIDSON said that twenty years ago naphthalene removal was a big problem for Birmingham. He conducted investigations, and eventually a plant was put in consisting of Livesey washers using a special solvent, with the result that complaints dwindled, and an efficiency of elimination of 99·8 p.ct. was obtained. In those days, however, it was easier to effect a cure than nowadays, for the simple reason that the gas contained the necessary oils in a vapour form to prevent the deposit of crystallized naphthalene.

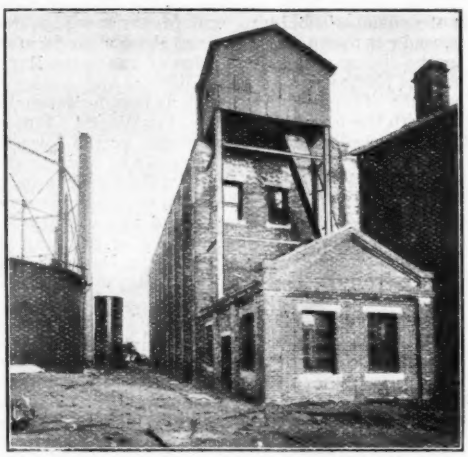
Dr. G. WEYMAN remarked that the formation of naphthalene was no doubt in recent practice rather tending to accentuate. The effect of non-admittance of air into the retorts certainly contributed to naphthalene formation; but apart from this, the tendency had been to raise the temperature of carbonizing. The Durham coals were a class in themselves, and they needed carbonizing at rather higher temperatures than the coals from other places. Probably this, as much as anything, was why they got perhaps more naphthalene than people dealing with Yorkshire or Scottish coals. The idea of making use of the water-gas oil was very ingenious; but the quantities had to be carefully balanced.

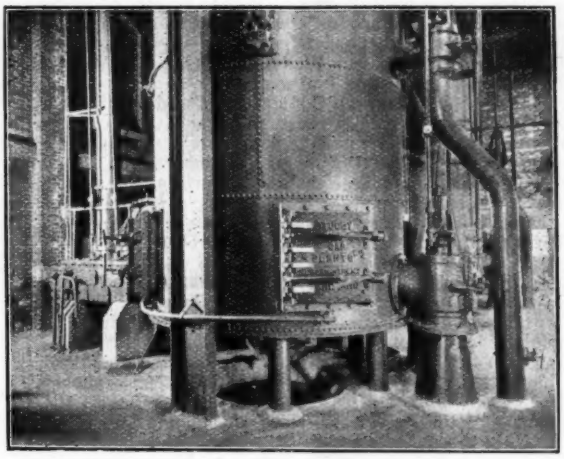
Mr. W. GREENFIELD wondered whether the gas industry had attempted the use of an electrolytical separation method.

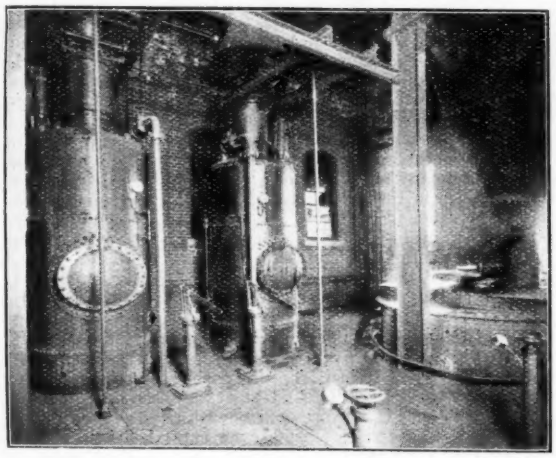
Mr. RICHARDSON said his works had never attempted electrolytical separation, and he did not think it had been tried in the gas industry of this country.

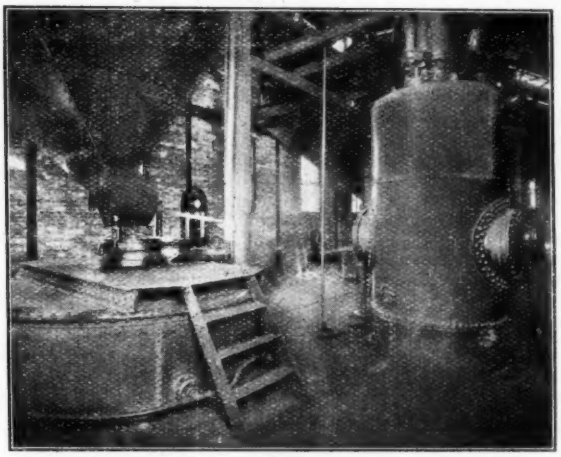
Gas Salesmen's Circle Meetings.—A meeting of the Midlands District Gas Salesmen's Circle is being held to-day (Wednesday), in the boardroom of the Cheltenham Gas Light and Coke Company; the business consisting in the reading and discussion of short papers on "Gas-Fires in Hotels and Boarding Houses," by Mr. H. J. Humphris, Distribution Superintendent at Cheltenham, and on "Gas-Fire Problems," by Mr. W. E. Cadwallader, of Birmingham. The next meeting of the Circle for the Southern District (London Area) is fixed for Tuesday, the 20th inst.; and Mr. W. L. Westbrook, of the North Middlesex Gas Company, has promised a paper on "Gas for Water Heating."

A TULLY PATENT COMPLETE GASIFICATION PLANT IN JAPAN.









We have received some interesting particulars of a 2 million c.ft. per day Tully plant, which has just been erected for the Kobe Gas Company by the Kawasaki Dockyard Company, of Japan, who are the Agents for the Tully Company in the East. This installation includes waste-heat boilers of the latest type.

The firm have had a letter from Mr. Kubo, the Chief Engineer of the Kobe Gas Company, stating that the plant is working to their entire satisfaction. Judging by the illustrations, the Kawasaki Dockyard Company appear to have made a first-class job of the plant, which they manufactured from the designs of the Tully Company. This is only to be expected, when one realizes that the Kawasaki Dockyard turn out battleships which compare very favourably with our own. There is no doubt that there will be a great development for the Tully system both in Japan and China, owing to the suitability of the coal for the plant in these regions and the resources and energy which the Kawasaki Dockyard Company bring to bear in developing the plant.

The construction of this work has been under the supervision of Mr. E. B. Tully, a son of Mr. C. B. Tully, and reflects great credit on him. As announced in our pages, the Tully Company have secured a number of contracts in the East. The photographs are self-explanatory, and show the waste-heat boilers.

GAS BILLS FOR 1923.

TO-DAY, as far as possible, we make our customary review of the Gas Bills which have been lodged for promotion in the next session of Parliament.

When the notices were published, there was intimation in that issued by the BARNSLEY CORPORATION that in a Various Purposes Bill they proposed to include provisions for the purchase, by agreement or compulsion, of the Barnsley Gas Company's undertaking. But in the Bill as deposited, the Corporation have not inserted any clauses for purchase. They still, however, propose to seek compulsory powers for acquiring part of the private railway siding of the Gas Company, and a small area of land near thereto, or easements thereover, for the benefit of the adjoining Corporation electricity works, which are in competition with the Company.

In an extensive Bill, the BIRKENHEAD CORPORATION have included clauses referring to the gas undertaking, and defining the limits of the Hoylake and West Kirby Gas and Water Company in the parish of Bidston. The gas clauses are of the usual order.

The CHESTERFIELD CORPORATION BILL is of varied character, and bulky. Part III. deals with the gas undertaking. The first clause in it enacts that "the gas undertaking as it exists at the commencement of this Act shall continue vested in the Corporation, and be held, used, and enjoyed by them." The gas limits are to be the borough, the urban district of Brampton and Walton, and the parishes of Barlow, Brimington, Calow, Duckmanton, Hasland, Temple Normanton, and Wingerworth in the rural district. Powers are sought to construct additional works on the lands upon part of which the Chesterfield and the Whittington works are situated. Following some clauses of usual character in modern gas legislation, is one which provides that, "subject to the provisions of this Act, the Corporation may supply gas for lighting, heating, motive power, warming, ventilating, and other purposes, and for the particular requirements of any trade, industry, manufacture, or business, upon such terms and conditions in all respects as may be agreed on between the Corporation and the persons supplied. It is proposed that the price to be charged by the Corporation for gas supplied by meter shall (unless and until the Board of Trade shall, pursuant to the provisions of the Gas Regulation Act, 1920, otherwise order) not exceed 5s. per 1000 c.ft. within the borough, nor 5s. 6d. per 1000 c.ft. outside the borough. Sanction is sought to the supply and letting on hire of gas apparatus, engines, &c.; and, as usual in municipal concerns, this business is to be self-supporting. The purchase and supply of coke-oven gas is a matter dealt with among a number of miscellaneous clauses of ordinary form. Later in the Bill there is a clause which proposes to repeal section 52 of the Chesterfield Gas and Water Board Act, 1895, and any other enactments relating to the Chesterfield Corporation (gas and water) 2¾ p.ct. redeemable stock created and issued under that section; and the Acts and Orders amending the Act are to have no effect until the whole of the stock has been redeemed or purchased and extinguished, and the provisions are to continue to apply as if this Act had not been passed. It is also provided that separate accounts shall be kept of the various trading undertakings. The application of the revenue of those undertakings is also dealt with, in-

cluding the provision of a reserve fund not exceeding a sum of one-fifth of the aggregate capital expenditure for the time being. Any balance of revenue or interest on the reserve fund, when this amounts to the prescribed maximum, is to be carried to the borough fund, from which any deficiencies are to be made up. Power is also taken to fit-up showrooms.

The Bill of the HOYLAKE AND WEST KIRBY GAS AND WATER COMPANY, LTD., was noticed on Jan. 10 [p. 81.]

The Bill of the MACCLESFIELD CORPORATION, and that of the OAKHAM GAS COMPANY have not yet come to hand.

The PLYMOUTH CORPORATION BILL contains clauses to enlarge their powers relating to the Devonport gas undertaking. They ask for authorization to charge differential prices, for release from the obligation to supply gas from any main for any other purpose than lighting or domestic use in any case where the main is insufficient for the supply, and for power to charge for reconnecting discontinued supplies. There is also a stand-by clause. These are ordinary clauses in modern gas legislation.

The RAWMARSH DISTRICT COUNCIL are in a General Bill seeking further powers in connection with their gas undertaking. In the preamble, it is mentioned that, by the Rawmarsh Gas (Temporary Increase of Charges) Order, 1921, the Council were authorized to increase the charges for gas to such an extent as should be sufficient, as far as could be estimated by them before the commencement of the period for which the charge was to be made, to enable the undertaking to be carried on without loss; but the price was not at any time to exceed 5s. 6d. per 1000 c.ft. if the quantity of gas consumed by any one person or firm in a year amounted to or exceeded 44,500 c.ft., and 5s. 9d. if the quantity consumed was less than that amount. In one of the clauses, the Council are now asking that these prices shall be established as maximum ones, with the same consumption conditions attached. It is proposed that discounts or rebates to consumers of gas in consideration of prompt payment shall not exceed 10 p.ct., or 15 p.ct. in the case of large consumers, provided that all discounts or rebates shall be of equal amount in like circumstances to all consumers. For prepayment supply, the hire charge is put at 1s. 3d. per 1000 c.ft. if a cooking-stove is included, and 1s. without. For the hire of a prepayment meter without fittings, 10 p.ct. of the cost is proposed. The Council include clauses as to the working-up and conversion of bye-products, with the one-third purchase restriction attached. Power is included for the purchase and supply of coke-oven gas; but the Council are not to be exempt from any General Act which may be passed relating to such gas. Authorization as to the supply of gas fittings and apparatus is included; but there is the obligation appended as to the adjustment of charges so as to meet any expenditure in this regard. There are several other clauses of quite ordinary character in modern legislation. In the financial section of the Bill, the Council ask to be empowered, with the consent of the Ministry of Health, to borrow such further moneys as may be necessary for their gas undertaking. A clause appears providing for deficiencies in the water or gas revenues being made good from the general district rate. [*Parliamentary Agents: Messrs. Baker & Son.*]

The SOUTH ELMSALL AND DISTRICT GAS COMPANY are seeking incorporation and the powers applying to statutory concerns. In 1900, the then undertakers were authorized to construct works and manufacture and supply gas in South Elmsall, South Kirkby, and North Elmsall, in the county of York. In 1909, the concern was assigned to Robert Porter and Sam Bowes Beaumont; and it was carried on by them as co-partners. Both owners died; and Mary Annie Porter and Mary Alice Beaumont, as the legal personal representatives, continued to carry on the undertaking. By an Order made on July 20 last in the Chancery Division, it was declared that the two ladies were entitled, and ought, to carry on the undertaking (but not after July 20, 1924, without the leave of the Court), with the view to the sale thereof as a going concern. The capital expended on the undertaking amounts to £28,000 and upwards. Additional capital expenditure is now required; hence the proposal to incorporate the present Company, and to purchase the undertaking under an agreement which has been sanctioned by the Court. The agreement (for which the confirmation of Parliament is now sought) appears as a schedule to the Bill. From it, it is seen that the purchase price is £26,750. The transfer is to take place and the purchase money is to be paid on the thirtieth day next after the day when the Bill receives the Royal Assent. The purchase money is subject to the payment of a bank debt of £10,530 17s. 4d., or such sum as may at the time be owing to the bank, and to any other liabilities of the vendors. The transfer is to be deemed as having taken effect as from March 31, 1922. Among the first clauses is one enacting that Henry Ellison, Fred Ellison, and all other persons who have subscribed to, or may hereafter become proprietors in, the undertaking, shall be united in a company, and be incorporated under the name of the South Elmsall and District Gas Company. The limits of the area of supply are defined. It is proposed that the capital shall be £50,000, consisting of £30,000 original capital (divided into 6000 shares of £5 each), and £20,000 of additional capital. As to borrowing powers, the Company desire authority to borrow in respect of the original capital any sum or sums not exceeding £9000, and one-third part of the additional capital raised and paid-up. The standard dividends proposed are on the original capital 10 p.ct., and on the part of the additional capital issued as ordinary 8 p.ct., and on the part issued as preference 7 p.ct. A number of usual clauses succeed. The necessary provision to confirm the agreement follows; and then works powers on scheduled land are sought—these being accompanied by the bye-products clause, including the one-third purchase restriction. The calorific value to be declared is 400 B.Th.U.; and with this are associated clauses as to variation of the declared value, adjustment of consumer's burners, and pressure. The standard price proposed per therm is 15·4d.; and the dividends are to be subject to the sliding-scale. The price of gas to the Rural District Council of Hemsworth for public lighting and other purposes within the limits of supply is to be such as may be determined in accordance with the provisions of the Gas-Works' Clauses Act, 1871, but not exceeding 15·4d. per therm, or the lowest price charged for the time being by the Company to any private consumer, whichever may be the lower. For the hire of prepayment meter and fittings, it is proposed that the maximum charge shall be 3·6d. per therm, with cooking-stove, and 3d. per therm if cooking-stove is not included. A large number of ordinary clauses appear. [*Parliamentary Agents: Messrs. Torr, Durnford, & Co.*]

A copy of the SOUTH OXFORDSHIRE WATER AND GAS COMPANY'S BILL has not yet been received.

The SOUTH STAFFORDSHIRE MOND GAS COMPANY'S BILL was noticed in the "JOURNAL" for Jan. 3 [p. 33].

The SWANAGE GAS COMPANY have a Bill in Parliament for the purpose of providing for the transfer to them of the undertaking of the Swanage Electricity Supply Company, Ltd., and to confer further powers in respect of the gas undertaking. The present Bill provides that the Electricity Company may transfer to the Gas Company, and the latter may accept the transfer of, the undertaking of the former upon, and subject to, such terms and conditions as may be agreed between them. Upon the transfer, the rights, powers, authorities, obligations, and liabilities of the Electricity Company, under their Order of 1906, will be transferred to, and be vested in, the Gas Company. The limits of supply for electricity are to be varied, and will include Swanage and the Parishes of Langton, Matravers, and Studland in the rural district of Wareham and Purbeck—all in the county of Dorset. All the necessary powers for carrying on the electricity undertaking are sought. Regarding the method of charging for electricity, it is provided that the Gas Company may in all or any cases where they supply electricity charge in respect of such supply by any method for the time being selected by them, and approved by the Minister of Transport. Turning to the gas clauses, it is proposed to extend the limits of supply to include the parish of Studland. Additional lands for works purposes are required. Passing over a number of miscellaneous clauses which are common to present-day gas legislation, it is next seen that the Company are proposing to take power to issue further capital not exceeding the sum of £80,000. In this connection, it is suggested that the dividend shall be not larger than 8 p.ct. in respect of the part of the capital issued as ordinary, unless a larger dividend be at any time necessary to make-up the deficiency of any previous one which shall have fallen short of 8 p.ct. In respect of preference capital, the maximum dividend is placed at 7 p.ct. As to borrowing powers, the Company suggest authorization up to one-half of the amount of the additional capital issued and paid up. Separate accounts of the gas and electricity undertakings are provided for. It is also intended to change the name of the Company to the Swanage Gas and Electricity Company. [*Parliamentary Agents: Messrs. Sharpe, Pritchard, & Co.*]

The TORQUAY CORPORATION in an Omnibus Bill have a section referring to their St. Mary Church gas undertaking. The first clause provides for discounts being allowed up to 10 p.ct. for prompt payment, and for large consumption up to 15 p.ct. The other clauses are of usual order, and refer chiefly to the relations between the consumers and the Corporation in respect of supply. The concluding clause of this section of the Bill alludes to the application of the gas revenue and interest on the reserve fund—the provision ending with the disposal of the net surplus revenue and the annual proceeds of the reserve fund when amounting to the prescribed rate. The Corporation may carry these moneys to the credit of the borough rate, or, at their option, may apply the surplus, or some part thereof, in reduction of the capital moneys borrowed for gas purposes, or to any other purposes of the gas undertaking. Any deficiency of income in any year is to be charged upon, and be payable out of, the borough rate. Section 60 of the St. Mary Church Local Board Act, 1868, and so much of Article XI. of the Torquay Extension Order, 1900, as relates to the application of the revenue of the gas undertaking are repealed; but it is provided that, in the event of any sale by the Corporation of the undertaking, the net proceeds of the sale shall be applied by them in the improvement of that part of the borough which immediately before the passing of this Act comprised the parish of St. Mary Church. Later another clause is found, which enacts that the Corporation may (if they think fit) apply money received by them on account of the revenue of any of their undertakings (including gas) to the construction, extension, and improvement of the works, and conveniences for the purposes of the undertaking, and in the provision of funds for working capital. But it is further provided that money shall only be so applied after the working and establishment expenses of the undertaking and the interest and sinking-fund payments in respect thereof have been provided for.

Southern Association of Gas Engineers and Managers (Western District).—The next meeting of the Western District of the Association has been fixed for 2.30 on Thursday, March 8, at the offices of the Exeter Gas Company.

THE FUTURE OF THE SMALL GAS-WORKS.

By NORTON H. HUMPHRYS.

The subject opened up by Mr. G. M. Gill (*ante*, p. 139) admits of treatment at great length, as it includes technical, financial, and commercial considerations, related not only to facilities for complying with the quality clauses in the Gas Regulation Act, 1920, but also to wider questions—such as the maintenance of sales in face of increasing competition, the earning of dividends for the shareholders, and solvent existence as a going concern.

If the Board of Trade decide to extend the operation of the Act, to include all non-statutory gas-works, without exemption, below a limit of 10 million c.ft. of gas per annum, there will be many aggravated examples of making bricks without straw. A year's profit may be absorbed by the cost of a standard calorimeter with appendages, housing accommodation, &c.

Small gas-works have been continually subject to hostile criticism, because they charge substantially more per 1000 c.ft. than large concerns; but Mr. Gill does many of them special injustice by placing works of 20 to 30 million c.ft. per annum in the same class as those of 2 to 3, by selecting the year 1921, and the price per 1000 c.ft. as factors for comparison. The working conditions are divergent to a greater extent than in any other class, the year 1921 possessed abnormal features that applied very unequally, and a special characteristic of the therm as a unit of charge is that it differs radically from the cubic foot.

With few exceptions, the 640 undertakings making less than 30 million c.ft. per annum are dependent upon straight coal gas. Here and there, one may find extended steaming, or experiments with coke-gas; but this is the exception rather than the rule, for reasons that will presently be in evidence. The commencement of the long coal strike found the average small gas-works in the last financial ditch, with the heavy burden of a maximum overdraft at the bank. Accumulated profit, if in existence at any time, had been an unknown quantity for some years, and nearly as much can be said of the amount available for dividend. There was no margin to soften-down the passing of the whole burden of increased cost direct to the consumer, even if such action brought the price of gas to a figure so high that sales were reduced. The year 1921 showed an actual loss. Large neighbours could ease matters to the extent of 50 p.ct. or so, by the use of a "mixed" gas, and even manage to tide over the emergency without increasing the selling price.

The new unit of charge has the effect of substantially weakening the damaging criticism above referred to. All concerns having a smaller output than 30 millions are not incompetently or extravagantly managed. Those turning out not less than half that quantity can, and do for the most part, employ competent supervision. An advertisement mentioning remuneration a trifle better than that current with the average union artizan, will elicit shoals of replies, including some of unexceptionable character; so there is nothing in the objections that eligible candidates are not available, or are too expensive. Many smaller works, who really cannot afford to pay a moderate retaining salary, are efficiently controlled by a consulting engineer or managing director, non-resident but making periodical visits. Bad management cannot continue in small works, without disastrous consequences; but in larger ones it may be to some extent masked by specially advantageous circumstances. Some concerns that "do as well as their neighbours" might, and ought, to be doing very much better.

Much has been said about the free choice of calorific value allowed by the Gas Regulation Act, 1920. The man in the street, not recognizing or not understanding the protecting effect of the addition that the price shall vary *pro rata* with the quality, might, and in fact does, conclude that former restrictions have been nullified, leaving him at the mercy of the company. A few large undertakings have brought about important reductions in calorific value; but the majority have preferred to keep near the former quality, knowing that consumers will have something to say, and will not be content to shut their eyes, open their main taps, and take anything between 200 and 600 B.Th.U. The liberty is more apparent than real, although applied to the small scale it may be a welcome means of relief from an unsuitable photometric standard. The only available means for reducing quality below 500 B.Th.U. is the inefficient and two-edged weapon known as "pulling air;" and flat flames are used in the district to an extent that one cannot afford to ignore. There is not a living wage in 5-candle gas. As a rule, the small district is chiefly residential in character, and does not offer the slightest prospect in the way of a large industrial business; or if this is not the case, one should pause before dropping the substance in favour of a more doubtful shadow. With few exceptions, the mains and services have reached a bad old age, and would not be passed as efficient by a modern gas-fitter. Perhaps the holder is a single-lift type. If the quality is reduced to the extent of 10 p.ct., there will be howls of the "Daily Mail" class all over the district; and if supply up to the main tap is improved, the meter (frequently the property of the user) and the interior distributing pipes are awkward matters to deal with.

Individual members of any one class are supposed to have a family likeness; but "all under 30" includes a heterogeneous mixture. Larger works can be operated under conditions sufficiently similar, as regards each class, to render the cost of materials and labour the chief factors in fixing the price of gas, but in this case there are differences, possibly more important than bare costs, that become prominent at a limit of about 10 millions. There is a great difference between the working of a 5 and a 25 million gas-works. If 30 to 10 is taken as the limit for the 6th, and all below 10 as the 7th class, we shall find that the latter are responsible for the high average of 7s. 6d. The other comes much nearer 5s. 10d.

The following are examples selected from a number of the latest available audited annual accounts:

A.	Year ended 30th June, 1922	Output, 128,038 therms (Cost per therm, 9·64d.)
B.	,, ,, 30th Sept., ,, ...	Output, 88,152 therms (Cost per therm, 10·34d.)
C.	,, ,, 30th June, ,, ...	Output, 35,337 therms (Cost per therm, 11·0d.)

A and B are statutory, and under the 1920 Act; the output of therms is calculated from the cubic feet of gas sent out, and from the official reports. C is not statutory; the therm output is based on analysis, photometric power, and similarity in work as compared with others. In each case the expenditure on repairs, for obvious reasons, is decidedly above the average, and all the usual revenue expenses are included.

A feature of my proposed class 7 is that the waste of retort capability and of labour is unavoidable, because neither can be run under full steam dur the greater part of the year. This causes both loss of quantity and deterioration of quality as regards the gas, and the working life of retorts and furnaces is shortened; also they develop cracks and other defects at an early period. All this does not assist a therm value to be maintained, within 10 p.ct. The wage bill will range from £30 per million c.ft. of gas manufactured, according to local labour conditions and the neighbourhood of competitors such as mines, iron works, or factories. A labour item of 1s. 6d. or even 2s. per 1000 c.ft. is not uncommon. The dry purifiers are changed once or twice per week through the winter, to the further prejudice of quantity and of uniform quality. The storage capacity is small, perhaps not so when compared *pro rata* with large undertakings, but as regards economical carbonizing, and extending the "full steam" period. The sales per mile of main are so small that even if the mains and services have been carefully and skilfully laid, which is not always the case, the percentage loss is not less than 10, and in practice more often nearer 20 p.ct. The establishment and overhead charges are necessarily high, and frequently exceed 1s. per 1000 c.ft.

Many of the defects that are inconsistent with good working results and compliance with the 1920 Act—the two matters have so much in common that the enforcement of the Act on a works making not less than 10 million c.ft. of gas per annum is a beneficial dose of physic, good for the constitution, if disagreeable to the taste—are due to the use of cheap but antiquated apparatus rejected by larger works. Some can at least be improved at very moderate expense. Consider the average hydraulic main, a small ⌂ section in one piece, supported directly on the partition walls of the settings, having a weir overflow at one end, and giving anything between one and two inches seal; or the tendency towards beds of six ⌂ retorts, 21 in. by 14 in. section, where 15 in. rounds and three or four in a setting would result in better working. The inelasticity of the present retort-house system is a great disadvantage. The setting is the unit, and there are objections inseparable from part-time labour. There is need for a setting that can be run as advantageously on half as on whole time, that can be controlled by one man, and be safely left for 8 or 10 hours unattended. The extension of purifiers, or rearrangement as larger vessels with dry lutes, can be managed at comparatively small cost, and the foul main, condensers, and washers can be overhauled. Welded-steel mains and services open up good prospects for reduction of unaccounted-for gas, and enterprising firms might provide this improvement free of first cost, by spreading payment over a term of years.

A large company, when negotiating for the merging of a small one, may not be inclined to take up the capital at par value, on the ground that it is a different thing from the present structural value, and that there are several miles of steel main, boosting plant, incidentals such as an application for a special Order, legal services, &c., to be provided for. If the proposed purchase is in a bad way, the shareholders might be disposed to accept a guaranteed dividend of moderate proportions that would leave margin for the other expenses. The capital expenditure on a five million works may be £5000, and the cost of main, &c., £3000. If the purchaser guarantees 5 p.ct., and raises the cash at 6 p.ct., the total liability is £430 per annum—or, say, 2s. per 1000 c.ft. of gas. If the gas can be sold at 6s., there would be a margin of 4s., and the large works could turn out another five millions at half that amount. But there is obviously a limit to the distance at which the cost of the main would exceed the saving in manufacture. And the possible difference between the quality of the new gas as compared with the old must be foreseen and provided for.

A controlling interest would certainly reduce establishment expenses, and possibly allow more favourable buying. But the chief advantage would be the application of modern selling arrangements, and service. There is not sufficient attention paid to the showroom, the sales and complaint departments, or selling campaigns in small districts. This is unfortunate, because competitors are developing energetic methods in this direction. The consumers are left to the tender mercies of the man-in-charge, who may be as indifferent as a cow looking over a hedge, or who may show capability. If the whole of the outside department is

handed over to the care of a local tradesman who is also interested in the sale of oils and petroleum, things are not improved. A sound business cannot be maintained on high charges and bad service. These difficulties might also be met by co-operation between several small undertakings, in the matters of buying and selling appliances. Purchase in bulk is an advantage if the gas can be delivered into the holders at a substantially cheaper rate by an undertaking at a distance, than when made on the spot; but it does not assist business in other ways. Perhaps this explains why selling in bulk, though prominent in all legal enactments, is so rarely practised.

The newly-discovered disease described as "chronic inertia" is not confined to the happy-go-lucky gentlemen; some directors among class 7 are badly affected. If they are stirred up by the Board of Trade to a fuller sense of responsibility and of opportunities, the industry will be benefitted both individually and collectively. But a concern that is "too small" (the usual excuse) to warrant energetic and efficient operation may as well be immediately consigned to the scrap heap, which in any case will be its ultimate destination, if that policy is maintained.

BUSINESS EFFICIENCY.

You cannot afford to do things in the old way. If any one doubts the truth of this statement, let him visit at once the Central Hall, Westminster, where he will in a very short space of time be convinced of the immense time and labour saving possibilities of a remarkable collection of aids to business efficiency. These are in connection with an exhibition which was opened in the hall named last Wednesday, by Mr. A. Neville Chamberlain, M.P., the Postmaster-General, and which will remain open until the end of the present week. Both the Organizers (the Office Appliance Trades Association) and the exhibitors are to be congratulated upon the valuable nature of the display. There is something to interest everybody in business—and particularly those executive and administrative departments who may for one reason or another be still working under out-of-date conditions. Increased business efficiency is of importance both to employer and employee; and visitors to the Central Hall will find in "Business Efficiency" an extensive exposition of modern inventions and services designed to obviate wasted time and energy and make more productive the staff-work of business. It will be a revelation to many, and an inspiration to all. All men of business are welcome; for the Association understand that business men are beginning to realize that, just as the works must be well organized for the maximum output of goods, so must the office be organized for proficient financial and general administration.

The now indispensable typewriter is to be seen in various forms (two of them English made). Several are portable, weighing not more than from 6 to 7 lbs. One machine will write in a bound book, another is quite noiseless in operation, another works by electric power, while yet another can be quickly taken down in parts for cleaning. There are book-keeping machines which typewrite and print figures on invoices, day books, ledgers, statements, and bank paying-in slips; adding up amounts, showing totals, presenting perpetual balances, and making book-keeping speedy and exact. Facsimile letter-printing machines will produce form-letters at the rate of 3000 per hour, indistinguishable from typewritten letters, at very low cost; while adding and calculating machines will do any arithmetical work far more accurately and more quickly than the most skilled human brain. Again, machines enable dictating to be done without shorthand.

Further ingenuity is manifested in a change and wages-paying machine, which gives correct change by the touch of a key. Say a customer's purchase is 4s. 3¾d., and £1 is tendered; the machine will place in the hand 15s. 8¼d. It pays wages at a very rapid rate. To pay (say) £3 9s. 4½d., one touch produces 9s. 4½d.—the £3 being paid in notes. There are accounting and tabulating machines, for producing statistics exactly and quickly, and worked on the punched-card principle. Statistics from unit cards can be obtained in printed form at the rate of 18,000 per hour. Addressing machines are now an important feature of office equipment; and they are to be found in forms which will address envelopes, &c., at the rate of from 1000 to 10,000 per hour, according to the size of the machine. A postal-stamping machine obviates the sticking of stamps. It franks envelopes with any stamp denomination at the rate of 250 letters per minute, seals the envelopes, and stacks them at the same operation. The latest forms of other devices now in use in all directions, which are on view, include time and costing clocks and systems. Cheque writers and protectors do away with that temptation which, alas, so often makes the thief. Loose-leaf books there are for every requirement—one so arranged as to enable the subjects of fifty leaves to be seen at a glance.

These are only some of the things that the Business Efficiency Exhibition contains; but they are amply sufficient to demonstrate its importance in furthering the cause of better business control and management.

At a Students' Meeting of the Institution of Civil Engineers this (Wednesday) evening, Mr. J. G. Kimber (Student) is to read a paper on "The Production, Enrichment, and Purification of Water Gas." Dr. Charles Carpenter will take the chair.

THE ELEMENTARY PRINCIPLES OF LIGHTING AND PHOTOMETRY.*

THE aim of this book, as stated by the author, is "to provide a brief and simple guide to the solutions of the problems most commonly met with in lighting engineering," though in some matters—photometry, for instance—it might be considered to go beyond the elementary stage. A foreword by Sir Joseph Petavel, Director of the National Physical Laboratory, emphasizes the great importance of the subject.

The book will probably be of special service to students. The sequence of subjects is, in the main, the best that could be selected. The initial chapter deals with "Light, Vision, and the Eye." We then pass on to Measurement of Candle Power and Distribution, Modern Light Sources, Measurement and Distribution of Illumination, Indoor and Outdoor Lighting, and Industrial and School Lighting. There are three final chapters dealing with special aspects such as Daylight Illumination, Colour in Illumination and Photometry, and Light Projection.

The lucid explanation of the chief characteristics of the eye and the factors determining the visibility of objects forms a useful introduction—though one might question whether readers who need some of this explanatory matter will understand some of the calculations involving integrations that occur later on. Some important principles are dealt with in this first chapter. A curve is given relating visual acuity and brightness; and this is used to illustrate the principle that the power of the eye to perceive detail diminishes rapidly when the illumination falls below a certain value, but is only moderately affected by subsequent increases in illumination. One would gather from this curve (apparently that derived by Koenig and Brodhun) that the eye is becoming "saturated" after a brightness of 3 foot-candles is attained. But it is a question how far this conclusion can be applied generally to different forms of visual effort; and it is common knowledge that some recent experiments in the United States suggest that, in practice, very much higher illuminations have a beneficial effect. This is a crucial point, on which further research is needed. In dealing with glare, Mr. Walsh likewise quotes two familiar rules: (1) That it is preferable to avoid surfaces of a brightness exceeding 3 candles per sq. in. within the direct range of vision; and (2) that the contrast between the brightest and darkest objects in the field of view should not exceed 100 : 1. Elsewhere in the book, Mr. Walsh gives good reasons for avoiding a multiplicity of references in the text. But these three items may be mentioned as instances of important results, where a reference to the original work would seem desirable, This chapter also contains a brief account of the structure of the eye, and the phenomena of adaptation and colour-perception as postulated in Edridge Green's theory.

Chapter II. deals with the chief photometric quantities, and the candle, the lumen, the foot-candle and other derived units are defined. The modern method of preserving the unit of candle power is explained; but it might have been well to refer to the old standard wax candle as the origin of the term. The treatment of brightness is good, and is illustrated by tables giving the brightness of typical illuminants and the reflection ratios of different materials. (Is it, by the way, established that the ratio for magnesium carbonate is as high as 98 p.ct.? This result has been found in the United States; but has it been confirmed at the National Physical Laboratory?) We notice that the author, while remarking, probably with truth, that the term "equivalent foot-candle" is apt to lead to confusion, admits that it is sometimes convenient. An instance in point is afforded by the diagram already mentioned, relating visual acuity and brightness, where this method is substantially employed by the author.

From his experience at the National Physical Laboratory, Mr. Walsh is well fitted to deal with the measurement of candle power; and his treatment is full and useful. Although the matter is dealt with mainly from the standpoint of tests of electric lamps, much of the information has a general bearing on photometry. The Bunsen and Lummer-Brodhun photometers are described, and the account of the use and equipment of the photometric bench, and the precautions necessary to ensure accuracy, deserve careful study. It is remarked that different flame sources may not be identically affected by barometric pressure, humidity, &c. Nevertheless, one presumes that such tests are best done with the aid of a flame standard, such as the Harcourt pentane lamp, which is mentioned but not described. Some account of the valuable work done at the National Physical Laboratory and elsewhere on this standard might well have been included. Flicker photometers are left to the chapter on "Colour," which also includes heterochromatic photometry. One is inclined to think that this subject might more fitly have been included with the rest of the treatment of photometry in Chapter II.

We come next (Chapter III.) to processes of determining polar curves of light distribution, and deriving "average" (mean spherical) candle power. The sphere photometer is fully dealt with,

* "The Elementary Principles of Lighting and Photometry." By John W. T. Walsh (Methuen and Co., Ltd., 1923, 10s. 6d. net. PP. 220, 85 diagrams).

and has evidently been the subject of much study. One is also interested to note that the much simpler cubical box is regarded as permitting fair accuracy. One would, however, have liked to find some guidance as to the utility of such apparatus for testing flame sources. Can the difficulty of the effect of partial enclosure on conditions of combustion be overcome?

In Chapter IV., the author gives a brief review of sources of light. Having previously expressed that, in view of the wide variations in the distribution of light from modern illuminants, the only proper basis of comparison is in terms of average candle power, the author is consistent in presenting all figures on this basis. Accordingly we find that electric vacuum lamps are credited with 0·61 to 0·71 average candles per watt; gasfilled electric lamps with 1·25 average candles per watt in the larger sizes and 0·8 average candles per watt in the smaller sizes. The taking-out of life-curves of electric lamps is very adequately dealt with; but one misses corresponding data on incandescent mantles, though it is stated that the diminution in light should not exceed 10 to 20 p.ct. during 1000 hours. For low-pressure gas-lighting 12 average candles per cubic foot of gas per hour is mentioned as usual, while up to 15 can be obtained with the latest superheated inverted burners. This value appears low in comparison with the duty mentioned in Mr. Sandeman's recent paper before the Illuminating Engineering Society, namely 30 (mean lower hemispherical) candles per cubic foot per hour. On the other hand, the value given for acetylene burners, 30 to 35 average candles per cubic foot of gas per hour, appears to be somewhat high. High-pressure gas is briefly treated, but the duty in this case is not stated.

The description of illumination photometers in the next chapter is complete and up-to-date. Mr. Walsh considers that under favourable conditions an accuracy of 2 to 3 p.ct., which would certainly suffice for most practical purposes, may be attained. But the precautions he enumerates as necessary to secure this accuracy are somewhat severe. One gathers that the use of a voltmeter, and probably also a regulating resistance, should be regarded as essential for accurate measurements. The subsequent remarks on the spacing of lamps and the determination of illumination follow familiar lines. The author gives the formula $x = AE/4\pi un$ where E is the illumination aimed at, A the number of square feet illuminated, n the number of lamps, x the average candle power, per lamp, and u the coefficient of utilization. Many lighting experts could doubtless make equally good predictions by the aid of simpler rules based on their personal experience of the system of lighting used. But the general nature of this formula, and the fact that it includes all the factors determining the resultant illumination, make it suitable for inclusion in a text-book. In experienced hands it should prove effective. But it evidently assumes fairly accurate knowledge of the lamps and lighting appliances, and some judgment of the "coefficient of utilization" of the system. The table given of such coefficients is of American origin, but is conceived on broad lines and should be of fairly general application.

The treatment of lighting problems covers very wide ground, and the matter is judiciously selected. Many phases of illumination, such as the lighting of streets, railways, shops, picture galleries, churches, &c., are briefly dealt with. The author has evidently made good use of the considerable amount of information obtained in recent years during discussions before the Illuminating Engineering Society. A special chapter is devoted to industrial and school lighting. The Home Office Departmental Committee's recommendations, and the requirements of American codes of industrial lighting are tabulated. One is glad to see a recognition that meticulous precision in specifying illumination for different purposes is not desirable, and that what is chiefly needed is an indication, easily grasped, of several main levels of illumination. In the present state of our knowledge we may conclude that in daily life most requirements are met by a value of 3 to 5 foot-candles, though in certain industrial or other special processes, involving very minute work or the use of very dark material, higher values may be needed. The use of light for purposes of advertisement or spectacular displays, as in shop-windows or on the stage, is naturally in a different category altogether. Another point is that the proper arrangement and method of shading of the light sources is quite as important as the degree of illumination provided; it is here that the skill of the lighting expert is chiefly tested.

In dealing with street lighting the author takes the reasonable view that the solution of the problem involves a compromise between avoidance of glare and extreme uniformity of illumination. A gradual change in illumination of 10 : 1 or even 15 : 1 is no great drawback, if this sacrifice of extreme uniformity is attended with compensating advantage.

The final chapters deal with a variety of specialized problems such as the production of artificial daylight, the design of motor-car headlights, the testing of searchlights, &c. On reading through the book one receives the impression that the cumulative gain in information on lighting problems during recent years has been very considerable; and the number of papers that have appeared dealing with various aspects of illumination is also great. The bibliography provided by the author is conveniently divided according to subjects, and there is an adequate index. There are numerous line illustrations. A few insets of photographs of typical lighting installations might, in the next edition, prove an additional attraction. The type and paper are both eminently satisfactory.

FRENCH GAS LEGISLATION.

The Industry's Calorific Power Basis.

We recorded on p. 644 of the "JOURNAL" for September 20 last that the amended Bill before the French Chamber of Deputies sought to provide that the quality of town gas should be defined solely by its calorific power, which was not to exceed 4000 calories nor to fall below 3500 calories per cub.m.; further, that undertakers were liable, by order of the Minister of Commerce, or, in the case of an undertaking holding public utility concessions, by order of the Minister of the Interior, to be compelled to extract from the gas manufactured such chemical products and carburants as might be necessary for industrial purposes, or for the consumption of, and all works connected with, the Défense Nationale. The Bill in its amended form was largely due to the work of a committee presided over by Senator Régnier; and the "Journal des Usines à Gaz" for Dec. 5 last reproduces *in extenso* the Committee's report. This is not without interest to gas men in this country, who have recently obtained a greater freedom—though on similar lines—than their friends across the Channel; but it appears that in France the matter has been considered from a standpoint much more restricted than in this country. There, the main objective which has led to the obliteration of the burden of illuminating standards is the provision of motor spirit and of the basis of explosives through the medium of home-produced benzole. Fortunately for us, our interests are wide and seemingly well-founded in the world's oil-fields (rather a sore point with our Allies), and in war the gas industry readily turned its hand to the scrubber; but there is the possibility (Heaven forfend!) of a sometime greater cataclysm than the last European war, when we may be glad of the experience of France in seeking to secure her independence of imported motor spirit. Her consumption of petrol amounts now to upwards of half-a-million tonnes a year.

BENZOLE FOR MOTOR SPIRIT AND MUNITIONS.

M. Régnier, in the first part of his report, deals exclusively with the possibilities of benzole; and he quotes at length the opinion in this respect of the Committee on Carbonization. The latter point out *inter alia* that the annual production of gas in France amounts to 1500 million cubic metres, of which 900 million furnished by the big undertakings could be washed for benzole—an increasing figure. A small works with a daily output of only 3600 cub.m. could, as a matter of fact, given a cheap supply of electricity, produce as much as 25 to 30 tonnes a year; the necessary plant having a net cost of some 30,000 francs, and a demand of 6-KW.-hours. Without this increment, however, the larger gas-works should put-out between 20,000 and 25,000 tonnes a year. The Carbonization Committee were of opinion that benzole should certainly form the basis of the "national carburant," which might be a mixture of 50 p.ct. of alcohol, 25 p.ct. of petrol, and 25 p.ct. of benzole, with which compound excellent results had been obtained. The Committee also referred to the saving in coal attainable by the admixture of water gas in town supply—officially limited to 20 p.ct., with a final CO content of 15 p.ct.—and adverted to the contribution to heat conservation which Métivier reckoned could be derived from the metallurgical industry—26,000 milliards of calories in gas, and over 70,000 tonnes of commercial benzole, besides heavy oils and pitch.

Benzene (for the synthesis of phenol), M. Régnier points out, and toluene are the bases of present-day high explosives; and the source of both is benzole, obtained from town gas works and metallurgical coke ovens, and to a small extent from coal-tar distillation. In the late war France's consumption of benzole for munitions purposes amounted to 240 tonnes a day, as follows: From gas-works, 30; coke-ovens, 20; Borneo oils, 30; Great Britain, 80; and America, 80. The coke-oven figure was noticeably low owing to the majority of works being in or near the occupied territory. Normally the coke-ovens would supply far more; and it is reckoned that the benzole from home production should total 80 tonnes a day (28,000 tonnes a year)—leaving a deficit of 160 tonnes to be imported.

France is finding the question of a home-produced motor fuel somewhat complicated. Technically it presents no difficulties; economically it is a different matter. The net price of alcohol for admixture purposes is prohibitive as compared with that of the imported spirit, especially when it is remembered that a one-third increase in consumption is required for an equal duty. The total make of benzole is at present too low, though it is cheaper than alcohol, for this product to take a substantial part in solving the problem; and the availability of ethyl alcohol, for admixture with the benzole, will meet a steep decline when German reparations deliveries of the former cease.

INCREASED CARBONIZATION.

It was mentioned above that the gas-works and coke-ovens could at present find some 28,000 tonnes of benzole; but M. Régnier's Committee consider that the figure might be greatly enhanced by the carbonization of all coal containing more than 16 p.ct. of volatiles—amounting to 30 million tonnes in all, with a benzole production of 150,000 tonnes. The admixture of an equal quantity of alcohol would give available motor fuel representing nearly half France's total requirements. To find this volume (1,500,000 hectolitres) of alcohol is not impossible—in 1913 the

production was 3 millions; but it means that the present output must be doubled. Unfortunately, in war-time output of alcohol must fall through shortage of man-power, whereas the demands of munitions and of increased motor transport are greatly enhanced.

Having thus reviewed the benzole situation in the light of the "national carburant" and the "*défense nationale*," the Report admits that the difficulties in meeting the country's demand are considerable; but whatever steps are taken in the direction of marketing a substitute for petrol or imposing a heavy protective duty on the imported spirit, it is considered that every effort should be made to increase the production of benzole. Such arguments led M. Régnier's Committee strongly to support the Calorific Power Bill, which they proceed to examine from the technical point of view.

(*To be continued.*)

A NATIONAL FUEL POLICY.

Current Problems at the Birmingham Fuel Symposium.

THE POSITION OF THE GAS INDUSTRY.

The Second Meeting (arranged under the auspices of the Birmingham and Midland Section of the Society of Chemical Industry) for the discussion of fuel problems was held at the University of Birmingham on Tuesday evening, Feb. 6. There was again a large attendance, which included many industrial chemists, gas chemists and engineers, and members of the Institutions of Mechanical and Electrical Engineers.

Dr. EDWARD B. MAXTED (Wolverhampton), who is Chairman of the Section, presided. In opening the second part of the fuel symposium, he pointed out that the chemical industry was inseparably associated with problems relating to fuel. Wherever fuel deposits were found, the chemical industry sprang up. The three gentlemen to give papers had been connected with the fuel industry for a large number of years, and the subjects to be discussed were: (1) The need for a national fuel policy; (2) some aspects of powdered coal firing; and (3) recent advances in fuel conservation. In regard to the first question (to be considered by Mr. Edgar C. Evans, of London) he observed that our only natural source of supply was coal, with peat as a problematic second best. From the national standpoint the effective utilization of coal should be aimed at. Any utilization of extraneous fuels not found in this country might lead to complications in times of national emergency; and in this connection he pointed to the great development that had taken place with regard to the burning of oil in the Royal Navy and the Mercantile Marine. The question of the use of powdered coal (upon which Mr. R. E. Keeling, of Birmingham, would make a contribution) was of peculiar interest, since it was a solid which might be treated as a liquid or a gas. In regard to fuel conservation, he observed that this matter was to be discussed by Dr. E. W. Smith, of London, who was formerly Chief Chemist at the Birmingham Gas Department and a Chairman of the Midland Chemical Section. They had followed his work with great interest since he left Birmingham.

THE NEED FOR A NATIONAL FUEL POLICY.

Mr. EDGAR C. EVANS, F.I.C. (London), said the particular aspect of the question he desired to touch upon was the necessity of looking at the problems of our individual coalfields from a national standpoint. Geographically, our coalfields were crowded together in a small area. The most remote were only a few hours' journey apart—and yet, despite their proximity to one another, it was surprising what few attempts had been made to co-ordinate the problems of one coalfield with those of another. This was specially true where problems of fuel technology were concerned, where the question was one connected with the utilization of a particular type of coal. Up to the present, very little had been done to take a national view of the matter. Work was being carried out in the various research laboratories of the country on the constitution of coal; work had been and was being done at various individual collieries on the particular problems of those collieries, but very little had been done to co-ordinate the mass of individual work available, and to draft in general terms a scheme of research—a method of attack which would be national and not local in its aspects.

There was, Mr. Evans said, great necessity for the production of a standard blast-furnace coke. The iron and steel industry required a coke uniform in composition. He thought the problem of excessive moisture in coke would eventually be solved by the adoption of continuous vertical retorts in which the coke would be cooled inside the oven, so that the only moisture in the material when it reached the furnaces would be that picked up *en route*. Regarding the ash content in coke, the last few years had seen the introduction of methods which opened up considerable possibilities. Probably the most important were in the direction of cleaning finely-divided coal. The elimination of shale was a simple elementary process of hydraulic separation, based primarily on the fact that the specific gravity of shale was considerably higher than that of coal. Apart, however, from the question of ash removal, the treatment of "fines" offered in some cases possibilities of reducing the sulphur content in the coal used for the manufacture of coke. This was rapidly becoming an acute question in some coalfields. Best-quality coking coals were being worked out, and second-class material would have to be used. Fortunately, research was showing a way out of the difficulty. It had been found possible by suitable preliminary treating to produce from coals of a low caking index a metallurgical coke as hard as blast-furnace coke, but possessing in a superlative degree the quality of "reactivity" or combustibility, which was becoming recognized as of the greatest importance in a blast-furnace fuel.

It would appear, said the author, that the problem of coke standardization was well within sight. With standard methods of preparation there should be little difficulty in producing from widely differing types of coal a blast-furnace coke of uniform hardness and density, of uniformly low ash content, and of high reactivity. He suggested that the production of smokeless fuel should be undertaken by the gas industry. It was with some trepidation that he approached this subject. The gas industry was a fighting industry; but they not only fought outsiders—they fought one another with equal energy. The advocate, for example, of a 550 B.Th.U. gas thought appalling things of the man who suggested a 400 B.Th.U. gas—hence the reason for trepidation; and yet the gas industry was one that was always ready to accept new ideas. The difficulty was that the industry had a millstone round its neck. Weighing it down were the charges of the past—parliamentary charges, capital charges, retorting and distributing plant—which made it very difficult to consider any revolutionary processes in the production and manufacture of gas. He ventured, however, despite these difficulties, to think that in the near future the industry would change its point of view. Up to the present they had had to think in terms entirely of gas. They had had to calculate costs purely from the point of view of the number of therms they could get in gas per ton of coal treated, and on this basis it was extremely difficult for the industry to make any systematic changes in its present methods of operation. Fuel technologists, for example, often wondered why the gas industry had not adopted coal cleaning on a large scale; why they were satisfied to produce year in and year out that remarkable material known as "gas coke." Yet, from the gas manager's standpoint of producing the greatest number of therms per ton of coal treated in an existing plant at the lowest possible cost, he was perfectly justified in turning-down methods of coal cleaning or other preliminary treatment as uneconomical.

It was now possible to produce in a gas-retort a high-class smokeless fuel which offered considerable possibilities for domestic use. The pioneers in the production of this fuel should be the various gas companies of the country. They were the pioneers of the rational treatment of coal, and they should lead the way in the new developments; but so long as the industry thought in terms of gas, it was not easy to demonstrate the value to them of smokeless fuel production on a large scale. At present they considered the 30 to 35 p.ct. of gas they got as their principal product, and the 65 to 70 p.ct. of other materials as bye-products, to be sold at any price that the market would pay. If, however, they would change their point of view, and regard gas as a bye-product and their fuel as the primary product, then there was a possibility of a revolution, not only in the gas industry, but in the whole of the methods of domestic fuel consumption in this country. At the present time gas was being sold from some of the coke-oven plants to gas companies at a price as low as 6d. per 1000 c.ft. He thought, if the gas industry went in for the production of smokeless fuel on a large scale, then, owing to the value of this fuel, it would result in the production of gas at a cost per therm considerably lower than that which was possible at the present time with existing plant and existing methods of operation.

There was enormous opening for smokeless fuel production on a big scale in England; and the gas industry was logically the one that should take-up this question. If it did, with the powers it now possessed and the monopoly it had in the production of gas for domestic purposes, it would secure a lead that would make it extremely difficult for outsiders to compete. There were difficulties in the way—some technical, some economic. Many realized these difficulties to the full; but he did not think they were insurmountable. As an example of the possibilities to the gas industry of the preliminary treatment of coal, the following particulars of a recent test were quoted: One ton of coal at 750° C. gave 70 p.ct. of coke containing 5 p.ct. of volatiles of a free-burning character; 53 to 54 lbs. of sulphate of ammonia, 15 gallons of tar; 4 gallons of light oils; and, in addition, 17,000 to 18,000 c.ft. of gas of a calorific value of 437 B.Th.U. per c.ft., the gas not containing more than 10 p.ct. of CO. It was premature to discuss the methods by which these results were obtained; but it was evident that a high yield was not inconsistent with a low carbonizing temperature and the production of a high-class smokeless fuel.

The last aspect of the question was the desirability of investigating the individual problems of the coalfields from a national standpoint. Every coalfield has its individual problem; but if the questions are viewed nationally, many of the difficulties disappear. Essentially the problem was one of increasing the "availability" of the fuel (to use Dr. Lander's expression), by producing the material in a size and of a character to allow of ready transportation from the coalfield and its use in boiler furnaces of the type at present available. Taking a broad glance at the fuel problems, he thought that a national view-point would go a long way to clear-up some of the difficulties now being experienced. The question was primarily one of co-ordination of the research of the country. A chain of research stations was required at the various coalfields, each of the stations specializing

more particularly on the problems of the field to which it was connected. On the governing board of these stations should be representatives, not only of coalowners, but of the iron and steel manufacturers, of the gas engineers, and of the fuel consumers. The work of these stations could be linked through one central organization, with the more academic work now being done at the various colleges of the country. This central organization would consist of the Fuel Research Board, who would co-ordinate the researches into a general policy applicable to the whole of the country. In this direction he desired to say a word of appreciation of the Fuel Research Board. As a Government institution, it suffered from inherent disadvantages which could not be overcome; on the other hand, it was attacking fuel problems from a broad standpoint, which would allow in the near future of the elaboration of a national fuel policy. This might take time; but it was bound to come, and once established would go far to bring about a more rational and scientific utilization of the fuel resources than had been possible in the past.

RECENT ADVANCES IN FUEL CONSERVATION.

Dr. E. W. SMITH, discussing recent advances in fuel conservation, on general grounds was in agreement with Mr. Evans. He was proud that gas engineers were fighters. They were fighters without animus. No industry was worth having if those in it were content with things as they were. Progression was essential. He agreed as to the necessity of co-ordination in regard to fuel utilization. The only direction in which they in the gas industry were fighting was that they had different views as to what was likely to be the best line of progress for the future. Mr. Evans had spoken of that awful material—coke. He agreed with him generally; but Birmingham rightly prided itself upon turning-out a coke which had not in it the defects mentioned by Mr. Evans. This coke was in great demand. It was low in water content, produced from good coals. It was so easily burned that the efficiencies obtained from the bulk of Birmingham coke were larger than those from coke produced in most other places. Mr. Evans could not understand why it was that coke could not become the primary product of the gas industry. He could not have thought of the economics of the position. If coke were the primary product, then it would be sold at a low cost; it was the duty of a gas undertaking to sell gas as cheaply as possible. He agreed that the gas industry would realize some time that it would pay them to cease making coke as coke, and that it would pay them to make a product (not through complete gasification) which would be free-burning, and have those other properties demanded by Mr. Evans in a domestic fuel. This would come.

Discussing the position of the gas industry as represented by the gas undertakings of the country, Dr. Smith said: There are many varying conceptions as to the functions of this great public-utility service. Its chief concern was the production and sale of suitable domestic and industrial gas at as low a price as is economically possible.

Any system of gas making, or any process that enhances the values of residuals, that will assist in the production of a more suitable gas, or will reduce the price of gas, is of national interest, and will always receive the eager and closest scrutiny of gas engineers. The gas industry was not, however, built-up in a day—as the result of a revolutionary idea. It has gradually evolved—too gradually for some—until it has reached the position it holds to day. In no industry is gradual change of more importance. The present is a time of great moment to all concerned—gas engineers, shareholders, and consumers. The instinct inspired by feelings of scientific impulse, justice, and equity—to adopt the therm basis of charge, and more important still the therm basis of evaluation of technical results—may bring about more radical changes than were thought of when the proposals were first made. It is not easy to foresee what will be the effect of the change to the therm basis; as yet it has had very little effect. So far as the consumer is concerned, the "therm basis," as such, can make no difference except that now he pays for heat quantitatively supplied. But this was the case before, where gas undertakings were obligated to maintain certain standards of calorific value.

The effect of the change is more likely to be felt at the manufacturing end than anywhere else. The introduction of the incandescent mantle was in my view of much greater importance, however, than the introduction of the therm. The latter is an obvious sequel to the former, prior to which the standard was that of intrinsic illumination, which was only roughly indicative of the value of the gas for all heating purposes. This, however, is all by the way, and could well form the subject of a paper to itself.

To come back to the original point. He was of the opinion that gas undertakings should not only supply suitable gas at a low price, but should develop the production and sale of smokeless, free-burning solid fuel suitable for domestic and industrial purposes. The net value of the coke available for sale on a gas-works is very little different from the net value of the gas made. It is, therefore, well worth while improving the quality of this so-called "bye-product" and enhancing its value as much as possible. A number of undertakings certainly do screen and grade their coke and keep the water content down to a reasonable figure, but more could very well be done. There is a growing public feeling that smoke must eventually be eliminated. At present the only practicable commodity which the gas industry offers is the gas-fire. It is suggested that if coal be completely gasified, and no coke left, that gas will be produced at a much cheaper cost. This has not yet been demonstrated. Why should it be necessary even to consider the creation of a completely new industry—namely, one for the production of smokeless fuel, coalite, or whatever one may like to call it. The gas industry, if it has the enterprise and foresight, should be more than equal to producing the solid free-burning fuel required at a lower cost than is possible in any other industry. Something can be done almost at once; but the ideal of to-day will not be attained for some time.

What is the ideal? It will sound absurd. That all types of coal—caking and non-caking, fines and large coal, high-ash and low-ash coals—shall be made available for the production of gas and smokeless solid free-burning fuel. How can this be attained? By: (1) Coal cleaning. (2) Coal blending. (3) Coal briquetting. (4) Coal briquette carbonization, and the production of gas and free-burning smokeless briquettes.

This will be done, and the cycle of operations will be made to pay as compared with present gas-works methods.

At the present time progress tends to be stultified by the differences existing between the numerous patentees. For my part I am of the opinion that there is not sufficient in any of the patents to prevent progressive concerns forging ahead in the direction indicated. The advantages of such a scheme will be at once appreciated by carbonization engineers; but I have not time to elaborate them.

I do not think I should let pass this opportunity of saying something concerning a topic that has apparently given rise to grave concern in the minds of the Editors of certain papers, and one "W. A. B." in the correspondence columns of "The Times." I am referring to the limits of percentage of CO in town gas. It should be noted that:

(1) It has not been shown that there have been during the last year more accidental deaths from CO poisoning than previously.
(2) It has not been shown that accidental gas-poisoning cases are more prevalent in districts where the CO is high in the gas, than where CO is low.
(3) It has been shown that there is no more CO in town gas generally than at any time during the last fifteen years.
(4) It has been shown that gas has been employed as a ready and convenient means for suicides to adopt since "W. A. B." first gave authoritative prominence to the matter.
(5) It has been shown that water gas is mixed with coal gas because by so doing the consumer obtains his gas at a lower cost.
(6) It has been shown that CO is one of the most valuable constituents of town gas from the point of view of all heating problems.

Much space in the Press is occupied by misleading queries and statements which can only be inspired by ignorance, vested interests, perverted motives, or misdirected concern for the public weal. To my mind it would be a grave mistake to put any limit to the percentage of CO in town gas. In saying this, however, I am of the opinion that except in a few special cases it is highly unlikely that the percentage of CO will be increased to a higher figure than the 20 p.ct. indicated by Dr. Haldane. It would be infinitely more to the point if such people as "W. A. B." would demand that the gas companies should be required regularly to test for soundness all domestic fittings. What about "inerts"? Under the therm basis, the consumer does not pay directly for inerts. Indirectly, however, I am of the opinion he pays more for his heat units where the inerts are higher than 20 p.ct.

As to the utilization of gas, town gas would be of no value to the consumer if he had no apparatus in which to burn it. Gas undertakings are as vitally concerned with the quality of gas appliances as is the consumer. Appliances can be made to suit town gas and give good results. The importance is therefore in the appliance rather than in the gas. The consumer is only theoretically interested in the price of gas, as compared with the over-all cost of the operation for which he is paying. Consequently, if he can have the efficiency of his appliance doubled, he should prefer it to having the price of gas halved.

The gas industry has done this in all directions during the last decade. Gas lighting, the cooker, the gas-fire, and gas-heated furnaces, all show such results, but these facts are little realized by the consumer. Much still requires to be done in all directions, as the highest attainable is far from having been reached. This applies more particularly to industrial furnace-work. The Institution of Gas Engineers through its Research Committees has done excellent work in connection with lighting, water boiling, and gas-fires; but so far as one can learn, no attention has been paid to industrial furnace efficiencies. I am aware that this subject bristles with difficulties; but I am convinced that a valuable programme of work could be undertaken which would be instrumental in improving furnace efficiencies to as great an extent as the work on gas-fires indicated the improvements that might be made. The difficulty would probably be how to determine the limits of the research. It might include inquiries into: (1) Insulating materials; (2) the conductivity of refractories; (3) the best means of attaining flame temperatures that approximate to the theoretical flame temperatures; (4) the value and limits of regeneration; (5) the relative values of radiant heat and flame-contact heat; and (6) thermal efficiencies of standard types of furnaces in use—and so one might go on. I am sure that the prosecution of such a research would amply repay the Institution of Gas Engineers.

GAS PROGRESS IN MANCHESTER.

Inauguration of the Enlarged Gas-Works at Bradford Road.

Tuesday in last week was a red-letter day in the history of the Manchester gas undertaking, for it signalized the completion of a great extension scheme—virtually the reconstruction of the Bradford Road Gas-Works of the Corporation. These works have been the head and front of the Manchester Gas Committee's business for many years. It is there that one of the largest gasholders in use in these Islands is situated. The contents of a hundred railway wagons are required to make gas that will once fill this big holder, and the outside circumference of it measures nearly a quarter-of-a-mile. Three types of retorts are in use at these works—the horizontal, the Woodall-Duckham, and the Glover-West—and the Committee are hopeful that the experience here gained will help to settle the question as to which is really the most effective and economical system.

A short sketch of the history of the Bradford Road works is worth reproducing.

The site was acquired by the Corporation in 1870, and the first works were constructed to competitive designs, the foundation stone being laid by the late Alderman Hopkinson, on Oct. 10, 1877. Gas making was commenced on Dec. 16, 1884. Additions and improvements have been made from time to time. The present area of the works is 52 acres 3856 square yards.

Early in 1914 it was decided to remodel the No. 1 retort-house as the first step of reconstruction and extension. New retort-benches, with coal conveyors, bunkers, stoking machinery of the Fiddes-Aldridge type, and coke-handling plant, were installed. The first half was put into commission at the end of 1916; the second half in 1917. War conditions interfered with further progress of other portions of the intended extensions.

In 1919 plans were prepared for a complete reconstruction of the older parts of the gas-works, and for increasing the output of coal gas. The works as now completed have a total capacity of 16 million c.ft. of coal gas, and 6 million c.ft. of carburetted water gas.

The new works extensions consist of a vertical coal-gas plant of a capacity of 8 million c.ft. per day, with coal and coke handling plant, railway sidings and coal store, condensers, exhausters, tar extractors, washer-scrubbers, steam-raising plant for the whole of the works, purifiers for an additional 8 millions of gas, and meter house containing two new, and five reconditioned, station meters, together with the necessary auxiliary plant.

OFFICIAL VISIT.

The Gas Committee, accompanied by the members of the Council and representatives of the Air Pollution Advisory Board and the local Councils supplied with Manchester gas, visited the gas-works on the 6th inst. in order to do honour to the official inauguration of the new extensions. To the Chairman of the Gas Committee (Alderman Sir William Kay, J.P.) was delegated the duty of opening the main gates at the Broxton Street entrance, and the party proceeded along the new road, 60 ft. wide, passing, *en route*, the gasholder to which reference has been made.

Next came the meter-house. Opposite is the new gas-making plant, with its extensive railway sidings, coal stores, coal-handling plant, coke conveyors, and storage bunkers, from which the coke is loaded into carts or railway wagons.

Standing on the railway staging, Councillor Harrison (the Chairman of the Bradford Road Sub-Committee) started the following operations: Wagons of coal were emptied by a mechanical device into a hopper, where the coal was broken into small pieces, and then elevated to the top of the retort-house, where are situated storage hoppers for feeding the retorts. These retorts are vertical—half being of the Glover-West type and the other half Woodall-Duckham—each set providing 4,000,000 c.ft. of gas daily. The operation of the retorts was demonstrated by the Lord Mayor (Councillor Wm. Cundiff), the Deputy Chairman of the Gas Committee. The visitors then followed the course of the gas from the retort-house. In the older portions of the works the coal is carbonized in horizontal retorts.

The works also contain a steam-raising plant with Stirling boilers, fitted with underfeed grates for firing with coke-slack. The ashes produced are removed automatically from the boiler-house by a conveyor. Attention was called to the power-house, fitted with two sets of generators and switch gear for driving the numerous electric-motors on the works. It was noted that for dealing with essential repairs and maintenance of such extensive mechanical processes there is an engineering shop fully equipped with latest appliances.

There is, of course, a large plant for the manufacture of sulphuric acid from the sulphur recovered at the purifying stage; and this acid is used in conjunction with the ammonia for the manufacture of sulphate of ammonia, of which about 4000 tons are made annually. The necessary laboratories for carrying out multifarious tests and general research, are up-to-date and well fitted. There is a coal-testing plant which is a miniature gas-works complete in every detail.

PRESENTATIONS.

Arrived at the purifying-house, the visitors halted for a while to give the contractors for the extension works an opportunity of testifying their goodwill towards Sir William Kay, Councillor Cundiff, and Councillor Harrison. But before this was done,

Sir WILLIAM KAY, addressing the assembly, said he ventured to say the Bradford Road works were quite as up-to-date as any in the kingdom. In fact, they were a little ahead of most installations, inasmuch as they represented a comparison of systems in the processes of gas manufacture. There were both horizontal and vertical types of retorts. There was a controversy in the gas world as to which was the best method of carbonization. Experience would tell, and he opined that the results obtained at these works would prove very valuable to the whole gas industry. Turning to the question of gaseous fuel for domestic purposes, Sir William said the policy of the Manchester Gas Committee had been to encourage the use of gas, and on the morrow he would be asking the City Council to assent to the Committee's proposition to reduce the gas charges another 6d. per 1000 c.ft.—making a reduction of 1s. 1d. in nine months. The Committee intended to persevere in this good work, and hoped in the near future to be able to point to even better results than any as yet attained. He believed it would soon be incumbent upon the Corporation to adopt the therm system of charging for gas used. It was, he thought, the right system. Concerning the gas department's part in Manchester life, Sir William remarked that it had given 3¼ million pounds in relief of the rates. Happily, this practice had been ended, and in the past nine months the gas consumers had received a present of £375,000 in the shape of reduced gas bills. This was the businesslike way in which to run the undertaking. At Partington, on the banks of the Ship Canal, they contemplated building works costing £900,000, which would probably enable the Committee to make gas at 1s. per 1000 c.ft. less than was now done at Bradford Road.

Sir ARTHUR DUCKHAM then, on behalf of the contractors, presented the Lord Mayor with a silver salver suitably inscribed, as a memento of the occasion. A similar gift was presented to Councillor Harrison. To Sir William Kay, who is noted for his enthusiastic support of the gas industry, Sir Arthur presented a statuette, wrought in solid silver by the Goldsmiths' and Silversmiths' Company, of London. The statuette represents Progress—a figure standing on a block of coal, the basis of power. Light is represented by a star, Power by a tooth-driving wheel, and Heat by a bunsen burner. These gifts were all suitably acknowledged.

THE LUNCHEON.

The party returned to the Town Hall for luncheon—the LORD MAYOR presiding.

The MAYOR OF CHESTERFIELD (Alderman Clarke) proposed "The Corporation and City of Manchester," to which the LORD MAYOR responded.

Alderman F. S. PHILLIPS (Chairman of the Salford Gas Committee), submitting the toast of "The Gas Industry and a Future Smokeless City," showed how the smoke fiend might be exorcised by a general use of gaseous fuel in place of raw coal in the domestic fire-grate. He gave it as his opinion that Manchester and Salford people lived in the dirtiest atmosphere in the world. [This dictum was afterwards questioned by Sir Arthur Duckham, who gave the pre-eminence in the matter of smoke and dirt to Sheffield.] Alderman Phillips also indulged in a tilt against the Press for magnifying the suicides lately associated with coal gas.

Sir WILLIAM KAY, in response, took occasion to cordially recognize the work done by the late Mr. J. G. Newbigging in the design of the Bradford Road extensions, and the valuable work of Mr. William Newbigging, Consulting Engineer. As showing the growth of gas consumption, Sir William said that, in spite of the mild weather and trade depression, the gas consumed in Manchester during the week ended Dec. 23, 1922, was 179,343,000 c.ft. The future of the gas industry, in his view, was a tremendous one. There were very close links between gas and electricity. These things and the good health of the community were bound together by a tie that would keep them together—good service and competition.

Sir ARTHUR DUCKHAM, who also responded, said it was almost unbelievable that a civilized people could sit down and let themselves be scourged by such an evil as smoke.

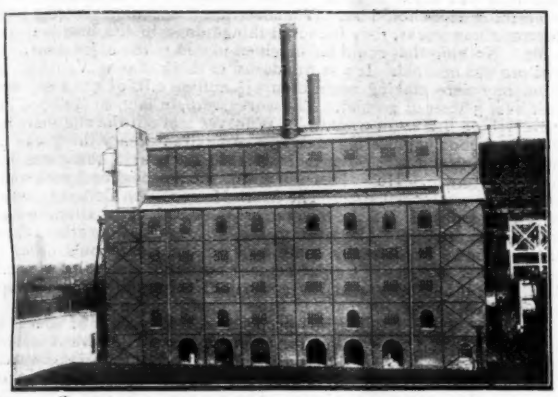
Mr. H. M. THORNTON, J.P. (of the Air Pollution Advisory Board), proposed the health of the Lord Mayor.

DESCRIPTION OF THE NEW VERTICAL RETORT PLANT.

The carbonizing plant of the last 4-million section which has been constructed at the Bradford Road works of the City of Manchester Gas Department comprises an installation of vertical retorts on the Woodall-Duckham system. It is formed in two

units, each unit being a bench of 24 retorts; and the carbonizing capacity of the whole plant is 336 tons of coal per 24 hours. The two benches are contained in a retort-house built up, in the usual way, of steel framework panelled with brickwork and carrying roofs of corrugated asbestos sheeting and patent glazing. The benches have been placed at right angles to the extensive overhead sidings existing at these works, and each bench is furnished completely with its own coal and coke handling machinery, so arranged as to be in duplicate for either bench.

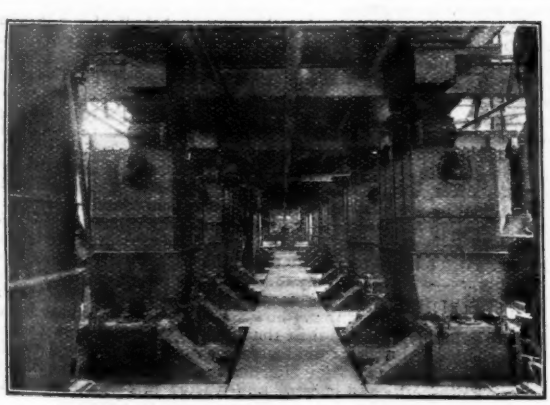
The retorts are heated by means of producer-gas generated in producers placed at each end of the bench. Three producers serve twelve retorts by common producer-gas flues, thereby ensuring very even heating. The producers are constructed to contain a large reserve of coke and need only be charged at four-hourly intervals, such charging being carried out without any check whatever on the producer gas generation. They are fitted into



The House Containing the Woodall-Duckham Vertical Retort Settings.

step-grates which eliminate all clinkering, and are built above ground in the same manner as the retorts. Advantage is taken of this fact in dealing with the ashes from the fires, which are dropped through cast-iron shoots directly from the clinker stage into skips at ground level.

Each retort is built entirely separately from the adjacent ones, and is provided with its own producer-gas, secondary-air, and waste-gas control. The operation of only one damper is required to control each retort, which gives only 48 dampers for a plant with a capacity of 336 tons of coal per day. The waste-gases from the combustion-chambers, after passing through the regenerators, are collected together in the centre bay of the bench, from which they pass either through waste-heat boilers—one of which is provided to each bench—or directly into brick-lined steel chimneys.



A View in the New House.

The waste-heat boilers are of the Woodall-Duckham standard design, being multi-tubular and of the fire-tube type, and each is capable of raising over 6000 lbs. of steam per hour. In addition to meeting the whole of the steam requirements for the retort-house, there is a surplus of from 6000 to 7000 lbs. per hour available for other works purposes. The induced-draught fans drawing the waste-gases through the boilers are driven by means of variable-speed electric motors, which enables complete control to be maintained over the draught on the settings. Before the steam from the waste-heat boilers enters the retorts, it is passed through a standard design of superheater arranged in the waste-gas inlet-flues to boilers, when its temperature is raised to about 600° Fahr. It is further superheated by passing through a series of specially arranged ducts at the bottom of each retort before coming in contact with the charge.

The arrangement of coal-handling to each section of the plant consists of two hydraulic end-tippers, which mechanically empty the coal from the wagons on the elevated siding into large receiving-hoppers suspended from underneath the rails. The coal is taken from these hoppers into either of two four-roll coal-breakers, each capable of dealing with about 45 tons of coal per hour. The broken coal falls into a rotary filler on to a gravity bucket conveyor which elevates it and discharges it into the compartments of the overhead storage hoppers above the settings. The descent of the coal from these hoppers through the retorts is on the usual principle—first passing into auxiliary hoppers attached to the top mouthpiece of the retorts, and then falling by gravity into the latter at a speed which is governed by the rate of extraction of the coke at the bottom. The extracting mechanism is simple yet very strong. The power required to operate this is comparatively small, being under 3 H.P. The coke is discharged from the retorts at intervals of two hours directly into telpher-skips, which are pushed by hand from under the bench to the centre of the retort-house, where they are picked up by means of a 3-ton telpher-machine. This machine takes the coke either into the coke-yard or outside coke-screening plant, or to the end of the retort-house, where it is discharged through a suitable hopper into the gravity bucket conveyors for elevating into the overhead storage hoppers above the producers. These hoppers are large enough to contain 48 hours' requirements of coal and coke, the coke-hoppers being fitted with permanent shoots for feeding the coke directly to the producers.

The unit type of setting, as constructed in this installation, is very suitable for large works; the retort being capable of carbonizing 7 tons of coal per day enabling the amount of labour to be reduced to a minimum. The whole of the operations for coal and coke feeding are made on one working level—namely, the top of the settings; and by reason of the combustion chambers and retorts being vertical, and the sight-boxes being extended up to the level of the top of the settings, an inspection of the whole of the heats of each retort for its complete length can be made from the same level. Each bench is made complete by the provision of a lift, which gives ready and convenient access to the various working platforms, which are interconnected.

VISIT TO THE VAUXHALL GAS-WORKS.

The London and Southern District Junior Gas Association.

The most complete arrangements were made at the Vauxhall works of the South Metropolitan Gas Company last Saturday afternoon for the comfort of members of the London and Southern District Junior Gas Association, who had been invited to visit this highly interesting station. The weather was of the sort that can best be described as "wretched;" but even this was not sufficient to damp the enthusiasm of the 120 or so members who turned up, or of the Engineer and members of his staff, who devoted the whole of their energies during the afternoon to looking after the welfare of the visitors. Everything, down to the smallest detail, had been methodically arranged; and matters which the guides fully explained in the course of the inspection were collated in more concise form in an illustrated booklet prepared for the occasion. This booklet included a block plan of the works, indicating in red the route to be followed, which embraced all that there was to be seen.

On arrival, the members were received by Mr. A. H. Andrews, the Engineer of the station, who subsequently led off a party among whom were the President of the Association (Mr. D. Cleave Cross, Lea Bridge) and the Hon. Secretary (Mr. George Winslow). In the case of other parties, the rôle of guide and friend was also ably filled by Messrs. H. C. Sims, J. Braidwood, F. Holland, F. White, A. Carter, L. Jones, L. Knight, T. Dart, A. J. Purser, R. M. Drummond, G. Bloomfield, W. Marshall, and E. C. Nash. The visitors were particularly gratified to see present Mr. T. S. F. Gibson (the Chief Civil Engineer of the Company), Mr. R. Macdonald (the Chief Mechanical Engineer), Mr. W. Payne (Engineer of the Bankside Station), and Mr. W. T. Layton (Editor of the Company's "Co-Partnership Journal").

The original Vauxhall works were the property of the Phœnix Gas Company, with whom the South Metropolitan Gas Company amalgamated at the beginning of 1880. Since that time, the works have been considerably extended, and now occupy a frontage of 485 ft. on the south side of the River Thames. Coal is received in the Company's steamers at East Greenwich and Rotherhithe coal-unloading jetties, where it is transferred to barges and taken to Vauxhall by the Company's tugs. The barges are unloaded at Vauxhall by six hydraulic cranes—five fitted with Barnard 9-cwt. grabs, and one with a 15-cwt. Hone grab. Three covered coal-stores and one open store accommodate a combined total of about 12,000 tons, which quantity is in addition to about 3000 tons generally contained in barges moored in the coal-unloading berths.

In the four retort-houses, each setting contains ten retorts, arranged in two columns of five retorts. All the retorts are 21 in. by 15 in. oval section, by 20 ft. long. Each of the houses is equipped with two hydraulic pushers of the Hunter-Barnett design, and two Arrol-Foulis hydraulic charging machines. The settings are heated on the generative principle, and built in sections of four. Each section is supplied with producer gas from two producers built one at each side of the section. The average weight of coal charged into the retorts is approximately 10½ cwt.,

and the duration of the carbonizing period is ten hours. The average make per retort per 24 hours is 95 therms, and the average make per ton 70 therms.

The coke from the retorts in three of the houses is received into cages constructed below the settings, cooled, and subsequently transported by a telpher arrangement to the elevator boots at the end of each retort-house. It is then elevated to overhead ferro-concrete hoppers, where it is screened and graded into the various sizes requisite for industrial and domestic use. Each retort-house is provided with Carpenter retort-house governors, fitted at each end of the bench. The gas, after leaving the retort-houses in four streams, is delivered into a common main at the inlet to the exhausters.

The six exhausters are in the main engine-house, and are all driven (four by belt, and two direct coupled) by the Farey type condensing steam-engine. The house also accommodates the pumping engines required to develop the 800 lbs. per sq. in. hydraulic pressure for working the hydraulic stoking and other machines. The condensing plant comprises three units of hydraulic tower condensers, which have a combined capacity of 67,000 therms per 24 hours. These units are worked in parallel. Each unit consists of two cylindrical towers, each about 40 ft. high and 9 ft. diameter. The towers contain 120 steel tubes, 3 in. diameter, which are expanded in diaphragm plates at the top end and bottom end. The gas passes up the tubes of the primary tower and down those of the secondary tower, and thence to the outlet main, while water which surrounds the tubes flows in an opposite direction. The water after leaving the towers flows to a cooling tower, where it is atmospherically cooled, and then again passes into circuit.

The shock condensation of the gas in this apparatus causes a deposit of naphthalene to form on the interior of the tubes of the condenser. This deposit is removed intermittently by pumping tar to a sealed chamber above the top diaphragm plate, and allowing it to flow down the tubes in the form of a film. The naphthalene is thus taken into solution. The amount of water pumped through the condensers is so regulated that the outlet temperature of the gas is kept within 1° or 2° Fahr. of the temperature of the inlet water, which approximates the temperature of the atmosphere.

From the condensers the gas passes through three Livesey washers (each of a nominal capacity of 22,000 therms per diem) worked in parallel; three tower scrubbers, of similar capacity, filled with wood boards on edge, and also worked in parallel; and three Kirkham, Hulett, and Chandler rotary washer-scrubbers worked in series. In these the gas is treated with clean water. The gas goes in two streams to the primary purification house, the chemical working of which is controlled in a laboratory adjacent. The primary purifiers are operated on the backward rotation system; and the gas contact is by upward displacement. The gas after treatment for the removal of hydrogen sulphide in the primary purifiers passes to the Carpenter-Evans sulphur extraction plant for the removal of carbon bisulphide. In this plant the gas is preheated to a temperature of 400° C. before passing into the reaction tubes. These tubes are fitted with porous grids supporting a catalytic agent in the form of nickel particles. The effect of contact with this medium at a certain temperature is to convert the carbon bisulphide contained in the gas into free carbon, which is deposited on the catalyst, and into hydrogen sulphide gas, which is arrested by subsequent treatment in the secondary purifiers. The accumulation of carbon in the reaction tubes is intermittently removed by an aëration process in which it is subjected to contact with a stream of heated air under pressure. After leaving the sulphur extraction plant, the gas is treated for the removal of traces of hydrogen sulphide by four secondary purifiers worked in pairs, operating in parallel. Both the primary and secondary purifiers are all charged with oxide of iron.

The naphthalene extraction plant consists of three Whessoe rotary washer-scrubbers, each having a working capacity of 22,000 therms per 24 hours. The naphthalene extraction oil is a product of the Company's works at Ordnance Wharf. About 15 grains of naphthalene per 100 c.ft. exist in the gas before treatment in the vessels, and this is reduced to a trace incapable of estimation after treatment. The quantity of oil used in these vessels is about 20 gallons per 5600 therms treated.

At the conclusion of the inspection, motor coaches conveyed the members to the Kennington Lane gasholder station near-by, to which the gas passes from the Vauxhall works through one 30-in. main and two 24-in. mains. The total capacity of the five holders is about 60,000 therms. The district governors are housed in the same building as the three station meters. To increase the pressure thrown by the holders at the inlet of the governors, four Sturtevant high-speed fans, driven by gas-engines, are utilized.

The efforts of the chemical control laboratory at Vauxhall are directed to the constant production of gas of standard quality. The standard calorific power of the Company is at present 560 B.Th.U. gross. The various chemical tests carried out on the gas comprise hourly spot tests for calorific power at the outlet of the plant. These tests serve as a guide for the regulation of gas making in the retort-house, and are confirmed by an hourly sample of 12 c.ft. collected at the inlet to the holders and tested. The chemical and physical characteristics of the purified gas are determined by a 12 c.ft. sample collected continuously over 24 hours. A Fairweather recording calorimeter registers the quality of the gas issuing from the holders to the district. The work of the chemical control department also includes the sampling and analyses of producer and waste gases, and the determination of efficiency in combustion of the boiler furnaces, together with analyses of fuel and flue gases. The whole of the water used in the boilers on the works and in the steam lorries of the station is softened by a continuous-working lime and soda plant. Periodical tests are made to ensure that the hardness is reduced to from 4° to 5°.

Returning to Vauxhall, the visitors found tea awaiting them in the Co-Partnership Institute—a commodious building provided by the Company for the use of their employees—and they were also treated to an excellent musical programme by the South Metropolitan Gas Company's Orchestra, under Mr. Herbert.

The PRESIDENT remarked that they had to thank the South Metropolitan Gas Company and Mr. Andrews for the most excellent entertainment they had given them that afternoon. It would be agreed that they had acted right up to the Company's standard of having everything as it should be. Whenever the Association visited a South Metropolitan works, they found all things done in the best way possible. Nothing that could be imagined to add to the enjoyment of the visitors was omitted. It was wonderful to think that at Vauxhall the Company were making more than 13½ million c.ft. of gas a day upon just over 5 acres of ground. The works were, in fact, so cramped that "everything had to go upward." Whoever laid out the site there had displayed good engineering abilities. An extraordinary thing was the way in which they got rid of their coke, for, of course, there was little room for storage. He had been struck by the thoroughness with which everything was looked after. The South Metropolitan Company looked after the men well, and the men reciprocated by looking after the plant well. Due credit must be given to Mr. Andrews and the other officers at the station; but it really came back to the Company's policy of looking after the men. Co-partnership no doubt did a lot of good. Altogether it had been a highly educational afternoon, and they appreciated very much all that had been done for them.

Mr. T. V. JOHNS (Richmond) proposed a hearty vote of thanks to the President and Directors of the Company, to Mr. Andrews and his assistants, to the orchestra, to those who had been responsible for their comfort at the tea-table, and to everyone else concerned in making the afternoon the success it had been. The members had had a splendid time. Judging by the price at which the Company were able to sell gas, and the therms per ton they got from their coal, it seemed that horizontal retort practice would take a lot of beating.

Mr. L. LACEY (Gas Light and Coke Company), seconding, said previous experience of visits to the South Metropolitan Company's stations had led them to anticipate the hearty welcome which they had received. Apart from the amount of work that was accomplished on so restricted an area, one of the most impressive things to him was the fact that the carbonizing plant in many respects had altered very little during the past fifteen years; and yet results were being obtained which were second to none.

Mr. W. J. LIBERTY said he would like to support the vote, and to recall the first occasion on which the Association had the privilege of visiting Vauxhall, some 22 years ago. Then they had the honour of being shown round by Mr. A. F. Browne, who was one of their earliest patrons, and had always taken great interest in the Association. They could not think of the South Metropolitan Gas Company without having in mind its honoured President, Dr. Carpenter. Anyone who had heard or read Dr. Carpenter's evidence before the Therm Inquiry Committee would agree that it formed an admirable treatise on modern gas practice.

Mr. ANDREWS, acknowledging the vote on behalf of the President and Directors of the Company, his staff, and himself, said the visit had been a great pleasure to them. In the booklet which he had compiled, he had drawn attention to the main features of the works. Though the works had been remodelled, some of the original features remained, and one of these was the manufacture of straight coal gas. It might not be within the knowledge of all of those present that under the Company's co-partnership scheme, the employees enjoyed a large share in the management. They had on the Board of Directors three representatives, one of whom (Mr. Walter Beard, a member of the Association) he was pleased to say was with them that afternoon. The Co-Partnership Institute included the main hall, with stage, in which they were assembled (intended for social functions organized by the Committee), a billiard room with two full-sized tables, a reading room, and a library—all provided by the Company for the use of the men. The efforts thus made for the social welfare of the men were highly appreciated. He desired to say how much he owed to his assistants, who had willingly given up their time to make the visit a success; to Mr. Herbert and his orchestra for their entertainment; and to Mrs. Greig and her staff for looking after the tea. He wished the Association every prosperity and success, and trusted this would not be the last occasion upon which they would pay a visit to Vauxhall.

Surplus Gases in Steelworks.—Mr. J. T. Wright, of Brotton, in a paper before the Cleveland Institution of Engineers, at Middlesbrough, said it was possible that a comprehensive study of the application of the surplus gases would enable a self-contained plant to operate a comparatively large steelworks without the use of any coal at the producers.

Recovery of Energy by Waste-Heat Boilers.—Tests made at a large water-gas plant in Illinois by Mr. W. A. Dunkley, Gas Engineer, of the United States Bureau of Mines, using coal from No. 2 Illinois seam as generator fuel, and operating with waste-heat boilers, showed that approximately 12 p.ct. of the heat introduced as fuel was recovered by the boilers, the steam generated corresponding to about 600 boiler horse power—more than enough to operate the gas sets. Without the waste-heat boilers, this energy would have been totally wasted. Recoverable heat was still going to waste.

SENSIBLE HEAT DISTILLATION OF CARBONACEOUS MATERIAL.

The December and January issues of the "Beama," the monthly journal of the British Electrical and Allied Manufacturers' Association, contain a contribution by Harald Nielsen, M.I.D.C.E., M.I.D.M.E., upon the subject of low-temperature carbonization. The author has carried out during the past few years a considerable number of tests on a comparatively large scale, and as a result of his work has formed many conclusions as to the best methods to employ in order to obtain the most successful results. Among these may be mentioned:

1.—With regard to capital cost and depreciation of the plant, it is preferable to have large continuous units for treatment in bulk.
2.—That to reduce the cost of fuel required for carbonizing, internal heating should be used.
3.—Large units require less power, ton for ton produced, than a corresponding greater number of small units.
4.—Continuously worked units are not subjected to the same contraction and expansion as intermittently worked plants, and consequently the maintenance costs are lower.

A contrast is made between external and internal heating. The amount of heat to be transferred is a function of the area of the heating surface, and it is shown that in this respect the externally heated retort has a marked superiority. (The question of heat transference and the various factors which influence this, was discussed by Mr. Nielsen in May, 1922; *vide*, "GAS JOURNAL," May 24, 1922, p. 446.)

It is pointed out that by shortening the distillation period to one-third or one-half, the radiation and convection losses are cut-down enormously, and the output of the plant increased *pro rata*. Also that the only limit to the size of the retort in which the coal is distilled by sensible heat is imposed by practical and constructional difficulties. A single retort unit having a throughput of no less than 100 tons per diem is now practically completed, and a 50 tons per 24 hour test plant is designed for erection in this country. This will be in operation in the course of a few months. A curve is given of the gases evolved by average bituminous coal during a distillation period of up to four hours. This is reproduced below:

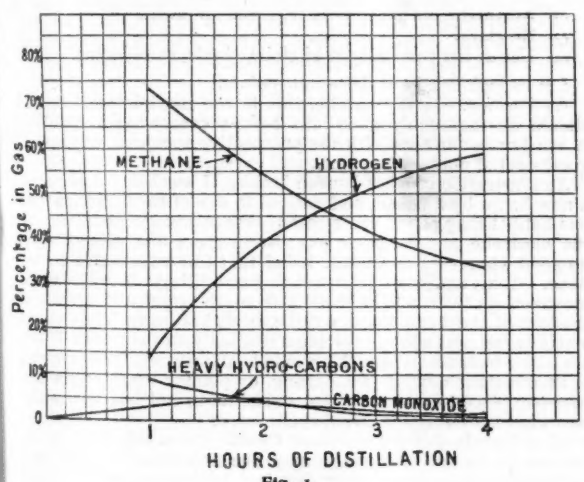


Fig. 1.

From this it is seen that the most valuable constituents—viz., CH_4, C_mH_n, and CO—reach their maximum values during the first two hours of treatment, and then gradually decrease, while the hydrogen content increases as the distillation is continued. It is suggested that the period of distillation should not be carried much beyond the point at which the methane curve cuts the hydrogen curve, providing the carbonizing of the coal could be effected in that time. This is only possible if sensible heat is employed, for if externally heated retorts were used it would mean that the coal layer should not exceed 2 in. in thickness, which is not a practical proposition.

Another diagram which is also of interest shows the specific gravity curve, and the relative gas production by internally heated and externally heated retorts.

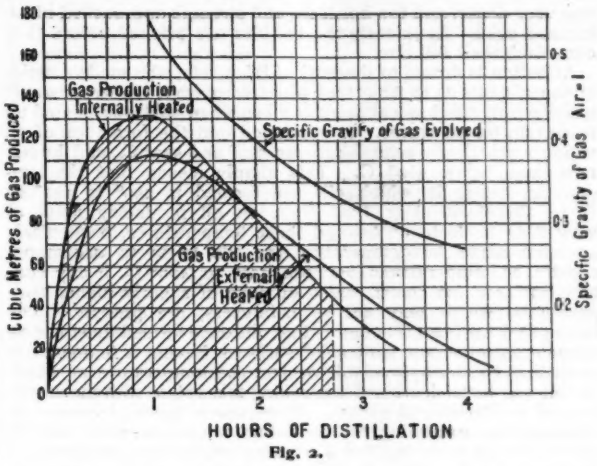


Fig. 2.

The increasing percentage of hydrogen reduces the specific gravity of the gas, and there is a considerable fall between the first and third hour of distillation accompanied by a corresponding decrease in the heating value per unit of volume. The curve of the internal heating rises much more quickly to a maximum, and falls far more abruptly than the other, more protracted, curve. On measuring the volume represented by the hatched part of the first curve, it will be found that between 75 and 80 p.ct. of the total volume of low-temperature gas is given off in the first two-and-three-quarter hours, and 70 to 75 p.ct. of the gas produced by external heating is evolved in the same period. These facts also point in the direction of it being desirable to discontinue the distillation beyond two to three hours maximum if the retorting process would lend itself to such purpose.

If it is a question of producing a solid smokeless fuel with oil and bye-product recovery, and there is a market for the gas produced, then the sensible heat of producer gas should be used for carbonizing, as in this way 35,000 to 40,000 c.ft. of mixed gas of 200 B.Th.U. per c.ft. are obtained per ton of coal treated. If no market for the gas exists, the producer gas should not be used continuously, but should be reinforced by stripped gas.

The application of internally heated rotary retorts to low-temperature carbonization problems falls into five distinct sections, viz.:

A. Low-temperature carbonization by means of the sensible heat of unignited producer gas for the production of a solid residue for domestic use from coking coals, with recovery of mixed gas, tar oils, and ammonium sulphate.
B. Carbonization by means of unignited producer gas of non-coking coals for the production of a non-coherent carbonaceous residue for powdered fuel firing, containing the required percentage of volatile matters, with recovery of tar oils and sulphate as well as mixed gas.
C. Carbonization by means of unignited or combusted producer gas of oil shales, &c.
D. Carbonization of coals by means of unignited producer gas, recovering the usual bye-products and complete gasification in recovery or non-recovery producers for the production of a high-grade gas for steel furnaces or cement kilns.
E. Carbonization of coals by means of superheated water gas for complete gasification for the production of a town gas with recovery of tar oils and ammonia.

The average obtainable results per ton from English coals by the various methods mentioned above are tabulated below.

TABLE I.

Section.	Cubic Feet of Mixed Gas Produced.	Heating Value per C.Ft. (Net).	Heating Value per C.Ft. (Gross).	Carbonaceous Residue Produced (Semi-Coke—including Producer Fuel).	Gallons of Tar Oils Produced.	Lbs. of Sulphate of Ammonia.	Cubic Feet of Blow Gas Produced.	Steam Recovered; Tons.	Over-all Thermal Efficiency; P.Ct.	Working Cost per Ton of Coal.	Remarks.
				Tons.						s. d.	
A . .	36,000	220	240	0·73	18–20	12–18	—	—	85–92	3 5	0·25 to 0·28 ton required in producer
B . .	38,000	210	235	0·71	16–20	12–18	—	—	85–90	3 5	0·25 to 0·28 ton required in producer
C . .	33,000	200	215	—	18–50	8–15	—	—	—	5 2	Heating value of spent shale not taken into consideration
D . .	105,000	180	200	—	15–18	—	—	0·4–0·5	80–85	4 0	Steel-works non-recovery gas
E . .	38,000	340–380	395–410	—	15–20	15–25	76,000	1·1–1·2	65–70	4 2	Heating value of blow gas = 70 to 90 B.Th.U. per c.ft.

The author then goes on to describe the plant, and draws attention to the paper given by Sir George Beilby before the Society of Chemical Industry on May 29, 1922, which indicates that the gas bubbles evolved while the coal is in a plastic state are responsible for the final structure of the coke and its density. When dealing with a highly coking Durham coal the author found that the resulting coke was neither hard nor dense. By admixing a certain percentage of fine breeze (20 to 24 p.ct.) the coke produced was very dense, and the hardness and strength approached blast-furnace coke. Apparently the bubbles are pricked before they can reach their full size.

Attention is drawn to the work of Börnstein, who made a series of experiments as to what took place, from what the writer would call a purely mechanical point of view, when coal was heated up to certain temperatures. It was found that the formation of oil vapours practically ceased between 500° and 550° C., and in certain cases below 500° C. This simply means that the temperature range in which oils are formed is 250° to 500° C. It is, therefore, clear that from an oil producing point of view it is futile to go beyond those temperatures, particularly as most crude low-temperature tar oils begin to decompose rapidly at temperatures between 350° to 400° C. if any contact surfaces, as retort walls, or coke of slightly higher temperatures, which may act as catalyzers, are present. The lesson to draw from this fact is that oils once formed must not be brought into contact with solid surfaces having a temperature exceeding, to any appreciable degree, the temperature at which the oil was formed, otherwise cracking takes place with the setting free of hydrogen and carbon. Superheated gases, however, at temperatures exceeding the formation temperature by 100° to 180° C. do not seem to effect a cracking action worth mentioning; hence, internal heating is far more satisfactory than external heating, because the large volume of gas necessarily present protects the oil vapours formed, and, secondly, the retort walls are the coldest part of the distilling system.

Many analyses of typical tar oils are tabulated, and the amount of tar oils recovered from a suitable bituminous coal treated in a rotary retort is given as 1 to 1·25 gallon per percentage of volatile matter removed from the raw coal. An extensive table is also given of analyses of different low-temperature gases and their properties in comparison with high-temperature gases. One of the most interesting features of the article is the view the author takes as to the influence of methane, which he regards as being directly responsible, in conjunction with the oxygen contents of the coal, for the composition of the gas evolved. This he hopes may eventually throw some more light on the formation and composition of coal gas by the distillation of carbonaceous material.

A consideration of the yield of ammonium sulphate concludes the contribution. Owing to the presence of a certain amount of steam and hydrogen in the producer gas, the author points out that the ammonia-forming conditions are very much more favourable than is the case in externally heated retorts.

Natural Gas Statistics.

Complete returns on the natural gas industry of the United States for 1921 again demonstrate, according to the figures compiled by Mr. R. S. M'Bride, of Washington, that it is no longer growing steadily in magnitude, as has been the case until the last few years. During the year named, only approximately 725,000 million c.ft. of gas were produced and marketed, which is a decrease of over 15 p.ct. as compared with the production for 1920. The value of the output of gas was roughly $175,000,000, which is slightly less than that for the previous year, but greater than in any of the years preceding 1920. The average value per 1000 c.ft. (26·4 c.) was the highest in the history of the industry. More than 2,600,000 domestic consumers and approximately 21,000 industrial or commercial users depend upon natural gas. Natural gas must be consumed as soon as produced. Hence the limit of quantity produced in any district is that amount which can be promptly marketed, either near-by or through pipe-lines leading to more or less distant cities. The production of natural gas in the United States has continued now for something like sixty years. Looking to the future, Mr. M'Bride is certain that the limited supplies of gas still available underground, and their relation to municipal centres or industrial markets, will make it impossible for very much more gas to be handled than was consumed each year during the period from 1916 to 1920. But even though the quantities of gas may not increase, it is likely that the average value will do so. The supply of natural gas in cities is practised along the same lines as the supply of manufactured gas. In fact, there are more communities in the United States so supplied with natural gas than with any variety of manufactured gas. Where it is thus sold, the distribution of natural gas is subject to the same municipal and State regulation as the manufactured gas.

Yorkshire Junior Gas Association.—At a meeting of the Association next Saturday afternoon, at the Gas Offices, Leeds Road, Huddersfield, Mr. E. L. Oughton will read a paper on "Subjects and Problems associated with the Distribution and Utilization of Gas."

The Illuminating Engineering Society.—At the next meeting of the Society, to be held at the Royal Society of Arts, on Tuesday evening, Feb. 20, a discussion on "The Projection of Light (Lanterns, Kinema Projectors, Flood-lighting, &c.)" will be opened by Mr. W. J. Jones and Mr. E. A. Marx, jun.

WALES AND MONMOUTHSHIRE JUNIOR GAS ASSOCIATION.

A general meeting of the Association was held at the offices of the Cardiff Gas Light and Coke Company, Bute Terrace, on Saturday, the 3rd inst., when Mr. T. B. ARMITAGE (the President), took the chair.

The first business on the agenda was a report of the delegates to the Joint Council meeting held in Manchester. The various matters under consideration were discussed, and the President and Secretary were thanked for their services in this connection. Afterwards the Secretary laid before the members the education scheme which it is proposed to adopt for the gas industry, and the several sections were elucidated.

Mr. E. R. B. FRENCH (Swansea) then read a paper entitled

RANDOM NOTES ON ARTIFICIAL LIGHTING.

The PRESIDENT, in introducing Mr. French, said he was giving his contribution under considerable difficulty, as the matter had been prepared at short notice. It was very commendable on Mr. French's part that he was willing to come forward so readily and assist.

In the first part of the paper, the author referred to the primitive methods of obtaining artificial light, and traced the developments to gas lighting and on to the present time. Dealing with modern lighting, he said:

A most essential point to bear in mind is, where a lighting installation of any description is being planned—be it the carcassing of a house, church, shop, office, workshop, railway station, public thoroughfare, or anything else, no matter how big or how small—to consider first: What has the light to do? Where is it to be placed? Particular attention should be paid to the purpose of each lamp, ensuring that we are using the light to the best advantage. Fixing lights in the wrong position not only proves of little practical value, but also means additional cost to the consumer, and may do positive harm, especially to the eyes. To ensure that the conditions of illumination are to give entire satisfaction, I think we might summarize a few of the chief points to be remembered:

(1) Position—so that the light will come from the right direction and not cast unnecessary shadows.
(2) Adequate, but not excessive, candle power.
(3) No glare.
(4) Use of the correct type of globe, shade, or reflector.

Let us look briefly at these four points.

(1) *Position.*—In my opinion this is the most important, and should be thoroughly gone into before carcassing a building. A word or two in time with the prospective occupant may save a great deal of unnecessary work and expense.

An illustration of what I mean is this. I was being shown over a new house by a friend, and noticed in one of the bedrooms that one light (I may say it was electric) was hanging directly above the wardrobe, and the other was also in a position where it was no good whatever; the result being that the work had to be redone. Take, again, a person reading or writing. What is more inconvenient than a light shining from the right and causing a shadow of the hand when writing, or lights immediately above which throw a shadow of the head and body on the work? There are many instances where this would be dangerous. For example, in illuminating a band saw, cutting, or planing machine, an improperly placed light may cause a shadow to fall just where the best light is essential to avoid spoilt work.

(2) *Adequate, but not excessive, Candle Power.*—It is very important for us not to underestimate the importance of providing sufficient illumination. First, because nowadays people expect and require good light. For comparison, take the thoroughfares of fifty years ago, when the flat-flame burner was in use, and then look at those of to-day with high or low pressure inverted burners. Care should be taken to allow for all circumstances, such as colour and condition of walls, heavy draperies, &c. The particular work to be done should also be taken into consideration. For instance, an adequate light for a person working on white cotton material would be inadequate for another working on a dark cloth. The illumination may be fairly high, but the brightness of the material too low. Good illumination in school, factory, office, home, or elsewhere is a matter of utmost importance. I mentioned at the heading of this paragraph adequate, but not excessive, candle power. How often do we see a universal burner in use where a medium or even a bijou would be sufficient, and would do all that is required! Points in saving of consumption appeal to the careful housewife quite as much as they do to the modern business man; and a little advice on these lines to consumers goes a long way towards gaining and retaining their confidence. The percentage of absorption of light by globes I will mention further on.

(3.) *No Glare.*—Owing to the intrinsic brilliancy of some of the present-day illuminants, it is most essential to avoid glare. You have all noticed, after looking into a brilliant light or being met on the road by a pair of powerful motor headlights, upon turning the head away or after the car has passed, for some little time afterwards a number of bright spots can be seen. The presence of these spots signifies that the retina of the eye has been strained unduly and is tired. Many accidents have been caused

through glaring lights. Another example is that of shop lighting. Bare lamps are likely to dazzle a prospective customer, whereas properly screened lamps show-off the goods to perfection.

(4.) *The Correct Type of Globe or Shade.*—It is obvious that the globes or shades used for spreading the light all over a classroom are not suitable for an office where the light is required in one or two particular places. In selecting a shade we should remember exactly how the light will be distributed from it. This will enable us to determine the shade most suitable for our requirements. While on this subject, I would like to remind you of the percentage of absorption of light by globes.

Clear globes	5 to 12 p.ct.
Holophane	5 ,, 15 ,,
Light sand-blasted	10 ,, 20 ,,
Alabaster	10 ,, 30 ,,
Canary coloured	15 ,, 20 ,,
Opaline	20 ,, 30 ,,
Opal	25 ,, 60 ,,
Milky	30 ,, 60 ,,
Signal green	80 ,, 90 ,,
Ruby	85 ,, 95 ,,
Cobalt blue	90 ,, 95 ,,

A really splendid globe now on the market is the vitreosil. Again, there is the silk shade. If these are used in very dark colours, as they often are, it is necessary to increase the number or size of the burners. The point as to the importance of shades may be illustrated. If one takes an ordinary inverted burner and makes an illumination curve of light, the lowest point of illumination will correspond with a vertical line drawn through the mantle, and the highest point of illumination may be at angles from the horizontal of (say) 15 to 40 degrees, (or thereabouts). If, however, a dark conical reflector is put over the mantle, the illumination at the angles near the vertical line will be increased by a considerable percentage. The value of parabolic shades for shop window lighting will be seen from this; the illumination directed upon the window being increased by nearly 50 p.ct. There are many points in the lighting of the home which should be better appreciated than at present. For instance, in the drawing room, what a difference it makes if the lighting is arranged in a cosy and artistic manner. Allow me to mention a few details which make all the difference to any room when finished.

Let us first be careful in the design of the pendant or bracket we are recommending; and, secondly, in our advice of the finish—*i.e.*, armour bright, oxidized copper, satin brass, oxidized silver, &c.—let us ensure that everything supplied for any particular room is finished alike, including burners, by-passes, switch light sets, lever cock chains, &c. Just imagine how a nice oxidized silver table lamp would look with an exquisite shade, and connected-up with ordinary flexible tubing, and possibly a polished-brass union cock.

Another matter upon which special stress should be laid is the maintenance of lighting in good condition when once it has been installed. People fully realize that dirty windows are at once commented upon. Why, therefore, should not the shades provided for artificial lighting be treated in a similar way? How often one comes into contact with schools and private houses, offices, &c., where large amounts have been expended on an installation which has then been sadly neglected. If it is nobody's business to attend to them, the outcome of it is poor light with excessive consumption; and the fault is put on the gas. The introduction of gas companies' maintenance schemes means satisfaction to the consumer, and is a sound policy. Consumers can rarely keep one's installation in such good repair or as economically as the gas company can. The time has passed when gas had only to be delivered to the meter. Progressive companies of the present day realize fully the importance of stimulating a desire for more and better light, and, when given an opportunity of so doing, the work should be carried out in the most efficient manner possible.

DISCUSSION.

Mr. A. H. SHEPHERD (Swansea) remarked that, while Mr. French had mentioned the particular burners to be used, he had omitted a very vital point—the necessity of having adequate supply pipes fixed.

Mr. H. T. LEWIS (Abertillery) spoke about the earlier systems of lighting and the crude methods employed.

Mr. A. W. STICKLER (Cardiff) said nothing had been mentioned regarding pneumatic switches. Advantage should be taken of this system of distance control.

Mr. J. HISLOP (Newport) thought that every consumer who visited the gas company's showrooms to purchase fittings and burners should not leave without some effort being made on the company's part to get him on the maintenance system.

Mr. V. DODGSON (Pontypridd) commented upon the advisability of inducing consumers to purchase their gas-fittings through the industry, so as to ensure satisfactory results. A good many travellers, especially in the Rhondda Valley, were going about selling a cheap and inferior article which was very harmful, and causing discomfort to the buyers.

Mr. J. W. HEARSON (Pontardawe) remarked on the ideal method of fixing points for lighting, and said that gas companies had been the biggest sinners in this respect, especially in the case of slot installations.

Mr. W. E. CROWLEY (Newport), Mr. A. W. VERITY (Newport), and Mr. R. HARDY (Cardiff) also spoke.

Mr. FRENCH, referring to adequate supply pipes, said it would be noted in the paper that it was intended to embody this consideration in the paragraph relating to the "importance of thoroughly going into the matter before carcassing any building." Special attention was called to the question of maintenance, which should be encouraged in every way. The usual charge made in his district was 1d. per burner per visit; the visits being made about once per month. It meant that in most cases, by introducing the maintenance scheme, they certainly retained a consumer who otherwise might be lost.

A vote of thanks was proposed by the PRESIDENT, Mr. G. H. G. HUGHES (Chepstow) seconded, and Mr. B. J. BELL (Hon. Secretary) supported, and at the same time brought before the members' notice many points of interest connected with lighting. One was with regard to the comparative costs of electricity and gas, and showed that there was a saving of 50 p.ct. in favour of gas, taking candle power for candle power, based on the charges at present prevailing at Cardiff.

The PRESIDENT announced that at the next meeting of the Association, in March, Mr. T. C. Canning (Newport) had promised to give a paper on the "Calorimeter."

SUITABLE TRAINING IN ILLUMINATING ENGINEERING.

ILLUMINATING engineering is a highly technical business, and is not therefore work that can be taken up without suitable education and training. This has not always been the view or the practice. The primary rule in illuminating work was at one time nothing more than personal inclination, and that beautifully arbitrary. The recognition that illuminating engineering is a matter that can only be carried on scientifically, is growing apace; and there is a numerical growth of the students who are studying the principles. But as yet no properly conditioned course of study has been prescribed. The subject was under discussion at a recent meeting of the Illuminating Engineering Society; and it was introduced by a paper of too extensive proportions for us to reproduce in the "JOURNAL." A précis of it must suffice for our readers. The authors were Messrs. C. E. Greenslade and J. E. S. White.

In the first place the authors favoured a simple arrangement of lectures at schools. The new generation should grow up with a better appreciation of the benefits of good lighting. The next step would be the continuation of the work in secondary schools. Here one would naturally avoid abstruse technical questions. Occasional lectures on the subject would not be regarded as a burden, but rather as a treat. Following this is the treatment of illumination at colleges and polytechnics, where students dealing with phases of science or engineering are working. While lighting is a subject that should naturally find some place in engineering courses, students in other fields—notably architecture and medicine—might also have their attention drawn to the subject by appropriate lectures. The exact nature of such courses offers a fruitful field for discussion. Engineering students, besides being instructed in technical matters, should have their attention drawn to the effects of light on the eye, and to the general considerations of shadows and appearance of buildings by artificial light, which guide the architect in his choice of systems of lighting. The chief modern illuminants (not merely electric lamps, but gas, oil, and acetylene sources), and the underlying physical principles of light production should be dealt with, and due attention given to shades and reflectors. Measurement of light and illumination should naturally form an important item, and should be dealt with on thoroughly modern lines. Colour is another subject which needs special treatment.

The method of arranging this instruction should be studied. In 1912 special courses of lectures on illumination were arranged in three of the chief technical institutes in London, under the auspices of the Illuminating Engineering Society; and there have been other special courses since. At educational centres where it is not very easy to graft instruction in illuminating engineering on to the existing syllabus, this mode of dealing with the subject, if necessary by the aid of outside lecturers, presents advantages. But in many cases a certain amount of work on lighting is already included, and might be modernized to form a regular part of the curriculum. The authors made a plea for the consideration of the use of light as a tool—a matter in which everyone is interested—rather than lamp-construction, in which relatively few students will be concerned in after-life. Nor should the course be confined to one illuminant. Students in electrical engineering, for example, should have the opportunity of learning what can be done with gas. Courses on electric wiring or gas-fitting might often be modified to include more on the arrangement of lights. Attention should be drawn to such fundamental points as the avoidance of glare, both from imperfectly screened sources and from polished surfaces, the amount of illumination for various purposes and its relation to the darkness of material used, and the importance of lights in eliminating troublesome shadows. The chief aim in a syllabus should be to illustrate principles by practical examples. Measurement of light and illumination is now a relatively simple process. Experiments should not be confined to tedious repetition work on a photometric bench, involving laborious calculations. Modern illumination photometers should be used to measure the actual illumination at various points in rooms. The explanation of the spectrum should be followed by simple demonstrations of the bearing of this knowledge on the efficiency of illuminants; and the subject of colour should be illustrated by reference to "artificial daylight." Such simple devices as the cubical box with whitened interior for measuring total flux of light should form part of the photometric equipment. Whatever form it assumes, instruction in illuminating engineering should find some place in the curriculum of leading technical institutions. The

authors also discussed the arrangement of a special third-year or post-graduate course at the larger institutions, in which the subject could be dealt with fully. What must be regarded as the logical outcome is the establishment at leading colleges of illuminating engineering departments. The need for experts on lighting is much better realized than in the past; and such steps as the inclusion of a requirement of adequate and suitable lighting in the Factory Acts, will doubtless provide additional incentive to take up illuminating engineering as a course of study. It is a matter for consideration whether such a department could be organized at the present time, or whether it should be allowed to grow gradually out of such developments as have already been suggested.

The nature of the syllabus will naturally depend on the time that can be allotted at each institution to illuminating engineering; but the following is given as a rough indication of some of the chief items that should be included:

Fundamental Quantities and Principles: Nature of light, reflection, refraction, and inverse square law. Candle power, illumination, brightness, reflecting and absorption coefficients, flux of light.

The Eye and the effect of brilliancy, contrast, glare, &c., and methods of shading.

Shades and Reflectors: Prismatic and matt surfaces, direct and indirect lighting, flood lighting, &c., and shadows.

Photometers for measuring light and illumination, polar curves of light distribution, integrating spheres and methods of measuring flux or mean spherical candle power.

Daylight Illumination: Design of window-space, measurement of daylight ratio, comparison of natural and artificial lighting.

Methods of Producing Light: Underlying physical theory. Gas lighting (high and low pressure), electric (glow, arc, vapour, &c.) lamps, acetylene and petrol-air gas, &c.

Practical Lighting Problems: Intensity of illumination for various purposes, choice of lighting units and spacing arrangements, comparison with daylight conditions, artificial daylight, maintenance problems, &c. Effect of colours of walls and ceilings. Illustrations based on lighting schools, libraries, shops, factories, streets, &c. Problems involved in lighting public buildings, museums, picture galleries, and buildings of architectural distinction.

Laboratory Work: Setting up an improvised grease-spot photometer, and examination of common types. Use of some form of illumination photometer in order to obtain a conception of "foot-candles." Study of illumination produced by various arrangements of lamps, and the effect of typical shades and reflectors. Tests with globe photometer (or simple cubical box). Measurement of brightness and coefficients of reflection.

These suggestions, the authors pointed out, are not in any sense exhaustive, and are intended merely to give an idea of the lines on which work might proceed.

FROM THE GAS POINT OF VIEW.

There were a number of speakers in the discussion. Among them were Dr. F. T. Chapman, Prof. French, Mr. A. Blok, Miss Squire, Mr. Leon Gaster, and Mr. W. A. Bishop. Viewed by a gas man, the observations of the last-named speaker were very much to the point. He noted with satisfaction that the authors referred to the several illuminants met with to-day; and he expressed general agreement with their recommendations.

The generous treatment given to the subject in the paper, in his opinion, was in noticeable contradistinction to the association of illuminating engineering with electrical engineering syllabuses—a point specifically made by one of the speakers in the course of the discussion. The subject of illuminating engineering was one of such magnitude as to warrant independent consideration; and the speaker urged that due regard be paid to all the forms of artificial light production. The point in question was surely the study of illumination, and not a study of light-yielding agents.

Education in the "use and abuse of artificial light," Mr. Bishop said, demanded consideration from two points of view. First, there was the creation of a desire for scientific illumination; and secondly the creation of qualified people to carry this desire into practical effect. The first condition was a matter which had received the zealous attention of the Society for many years; and any suggestion whereby the work of the Society might be extended for the purpose of creating the illuminating engineer would, he was sure, find very general sympathy and support. It was from this viewpoint—the provision of the qualified man to deal with the many and varied problems which arose in connection with the application of artificial light—that he was desirous of speaking.

The suggestion to co-operate with the various education authorities in the matter of lectures on illumination was, he thought, one that should be well received, as this sort of thing would very usefully augment the general science syllabuses, which were none too replete in many cases. Having regard to the attention given to mathematics and physics in our schools to-day, it occurred to him that the scientific principles underlying illumination would be fairly readily assimilated, if presented in an elementary manner. It should be possible, he ventured to suggest, for those students who were keenly interested in illumination problems to attend extension courses (arranged in conjunction with the school lectures) held at neighbouring polytechnics and technical institutions. At present, so far as his limited experiences went, the elements of illuminating engineering were crammed into the general study of electrical engineering and gas supply, with the result that only a confusing "smattering" of knowledge was assimilated by the student. Speaking from the gas point of view, he was convinced there was much to be done in educating gas-supply students in the science and art of illumination, particularly from the practical standpoint.

It was highly important that, associated with the question of gas-lighting, the following matters should be dealt with at some useful length: (1) Intensity of illumination to be provided for various purposes. (2) Lay-out of lighting units—heights, distances apart, &c. (3) Use of reflectors, diffusing mediums, &c. Such matters were of great practical value to the students who attended these courses with the object of learning, among other things, how to utilize gas scientifically as a light, heat, and power-producing agent. It seemed a great pity to him that the principles of good lighting did not receive greater consideration in these curricula; and he personally welcomed the suggestion to lay down some definite course of study, preferably independent of either electrical engineering or gas supply, whereby young men in the gas industry's ranks might equip themselves to fulfil the rôle of practical illuminating engineer. He endorsed remarks made by Mr. Blok in relation to the practical requirements of the wireman and the gas-fitter. They must not forget the gas-fitter, for he, as well as the wireman, had a function to fulfil with regard to practical illuminating engineering. Laboratory study was very necessary, but a practical understanding of installation work—a knowledge of how to hang lighting units—was even more important. One must not lose sight of the requirements of the craftsman, who, after all was said and done, was an indispensable factor. Intelligent workmen were a very great asset. Let them not overlook this fact. Rather let them strive to help them forward in their desire to obtain information. Many such men were to his personal knowledge keenly interested in acquiring data on the subject; but where were the facilities?

Much research had been devoted of late years to increasing the commercial efficiency of gas-lighting, and in designing attractive lighting units, automatic-lighters, &c.; but the principles of good lighting—the actual work of installing gas-lighting systems—needed to be better understood and applied generally. Any scheme which would help forward educational matters in this direction would be appreciated in gas circles, as at the moment there seemed to be a great wave of lighting enthusiasm pervading the industry. He was told by one of the directors of a large firm of gas-lighting engineers that the output of his works during the present season had constituted a record. Therefore it was obvious that adequate reason exists why illuminating engineering should receive the very loyal support of gas-supply undertakings—a matter which his Chief (Mr. Sandeman) strongly urged in a paper read before this Society in December, 1921.

In conclusion, Mr. Bishop mentioned that some little while ago the British Commercial Gas Association published an interesting book entitled "Gas Notes for Teachers," embodying the manufacture, distribution, and utilization of gas. Gas-supply undertakings purchased quantities of these books, and distributed them to the various head masters and head mistresses of the schools within their respective areas. So far as his district (Croydon) was concerned, the books were greatly appreciated by the teachers, and he believed good use had been made of the publication.

Tottenham District Light, Heat, and Power Company.

At the annual meeting next Tuesday, the Directors will submit the accounts for the year ended Dec. 31. These show, after payment of dividends in respect of the half year to June, at the rate of 5 p.ct. per annum on the preference stock, 7½ p.ct. on the "A" stock, and 6 p.ct. per annum on the "B" stock (all less income-tax), and providing for interest and all other standing charges, an available balance, including a sum of £18,263 brought forward, of £70,168. The Directors recommend the payment of dividends in respect of the half year to December at the rate of 5 p.ct. per annum on the preference stock, 8 p.ct. per annum on the "A" stock, and 6½ p.ct. per annum on the "B" stock (all less income-tax). The Company increased the calorific value of the gas, as from July 1 last, from 450 to 500 B.Th.U., and at the same time reduced the price to 11d. per therm. The Directors record in their report their deep sense of the loss which they and the Company have sustained by the death of their late Chairman, the Right Hon. Sir Daniel F. Goddard, their highly valued and respected colleague for twenty-five years. The Directors also regret to report the death of Mr. James Randall, who served the Company faithfully in various capacities the whole of his working life, a period of seventy-one years—a most honourable and probably unique record. Mr. Henry Woodall, M.Inst.C.E., has been elected Chairman of the Company, and Mr. Henry Bailey, Deputy Chairman. Mr. Arthur E. Broadberry, who has been in the Company's service for forty-three years, and Mr. William A. Surridge, who has been connected with the gas industry for many years, have been appointed to fill the vacancies on the Board.

Gas Failure at Longridge.—Longridge was without a supply of gas on the 6th inst., through an accident at the works; the Company requesting all consumers by circular to turn-out lights at 6 p.m. The Council's petition to the Board of Trade asking for an inquiry into the condition of the gas supply has been completed and dispatched.

Walsall's Gas Management.—The Gas Committee of the Walsall Town Council have recommended that a gas engineer be appointed at a salary of £600 per annum, to reside at the house now occupied by the assistant engineer at the Pleck Gas-Works; that he be provided with coal and gas (the committee estimating the free house, coal, and gas to be worth £100 per annum in addition to the salary), and that he receive annual increases of £25 for each of the next four years' approved services, until the maximum salary and emoluments amount to £800.

REGISTER OF PATENTS.

Gas-Fires.—No. 175,636.

KENNEDY, W., of New York.

No. 4577; Feb. 16, 1922.

Convention date, Feb. 16, 1921.

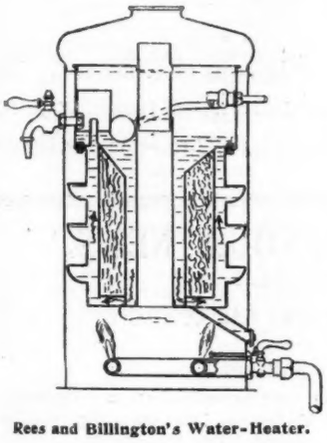
According to this invention, a gas-heater of the radiant type is so designed that it may be converted by interchangeable parts into various forms and designs, adapting it to various uses—such, for instance, as where it may be desired to have the heater within a recess or stand out in the open with or without a hood, and with or without various ornamental features which may be substituted or eliminated as preferable for the particular use for which the heater is intended.

Water-Heaters.—No. 189,312.

REES, T. LL. H., of West Kensington, W. 14, and BILLINGTON, W. J., of Tooting, S.W. 17.

No. 27,752; Oct. 19, 1921.

This invention relates to water-heaters of the kind in which a displacer is employed so constructed as to permit of its ready removal for access to the inner parts for cleaning purposes; and it has for its object certain improvements according to which a single water container is employed divided, by means of the displacer, into three intercommunicating chambers, two of which are arranged so as to be directly exposed to the heating gases, while the other forms a cistern or storage for cold water—the communication between all the chambers being effected without the aid of pipes. Further, inner and outer flues are provided, the outer one being gathered in at the top to form a mouth and the central or inner one terminating below the mouth, whereby an ejector action is produced causing a brisk flow of the heated gases.



Rees and Billington's Water-Heater.

The construction is clearly illustrated by the accompanying vertical section.

The water container has horizontally projecting peripheral pockets or cavities, provided with an undercurved portion and an upper flat portion; the outside diameter of the pockets being such as to enable the container to fit snugly within the outer case, at the same time leaving all round it a space for the gases.

Secured by nuts to a horizontal annular surface of the container is an inner annular body filled with asbestos or other heat-proof material, and at its lower end provided with a flange whereby it is supported in spaced relationship to the bottom of the water container. Perforations permit the circulation of the water from the inside of the exterior compartment.

The general arrangement will be seen in the drawing; and it is evident that the construction permits easy dismantling for cleaning purposes.

Lighting Controllers.—No. 191,353.

SOUTH METROPOLITAN GAS COMPANY and HARRIS, H. W., both of Old Kent Road, S.E. 15.

No. 31,386; Sept. 1, 1921.

The object of this invention is to provide improved means for fitting in position such apparatus as is described in specification No. 189,547 (see "JOURNAL" for Jan. 3, p. 39).

In one way of carrying out the invention as applied to the controlling of the flow of gas to street lamps, the clock and motor mechanism for controlling the plug of a gas tap is enclosed in a case to the side of which a rigid plate is secured by screws passing through holes in the case and engaging threaded holes in the frame on which the clock and motor are mounted. The gas plug is mounted in a block having a plane surface, the plug being so positioned that its axis is parallel with the plane face of the block, to which the rigid plate is adapted to be detachably clamped; and the correct positioning of the parts is ensured by dowel pins.

By this arrangement the correct assembling of the gas tap and the clock and motor mechanism is facilitated; and the clock and motor mechanism can be taken away and replaced or interchanged, without disturbing the gas connections, simply by the removal of a butterfly nut.

Burner Fittings.—No. 190,856.

KEMPTON, C. H., & Co., LTD., and KEMPTON, C. H. A., both of Westminster Bridge Road, S.E. 11.

No. 29,427; Nov. 4, 1921.

This invention refers to improvements in burner fittings of the bunsen type used in connection with inverted incandescent gas-burners in which the globe is suspended from above. The patentees point out that it has been the common practice to space the upper portion of the globe from the burner fitting, and to suspend the same by means of three screws from an intermediate metal casing or gallery which is clamped between two parts of the burner. This gallery is perforated or of openwork construction so as to permit the escape of the products of combustion; and it is in most cases relatively large, being seldom less than three-quarters of the diameter of the globe it serves to support. It is claimed that this shuts off much of the light, and results in giving the fitting a clumsy appearance.

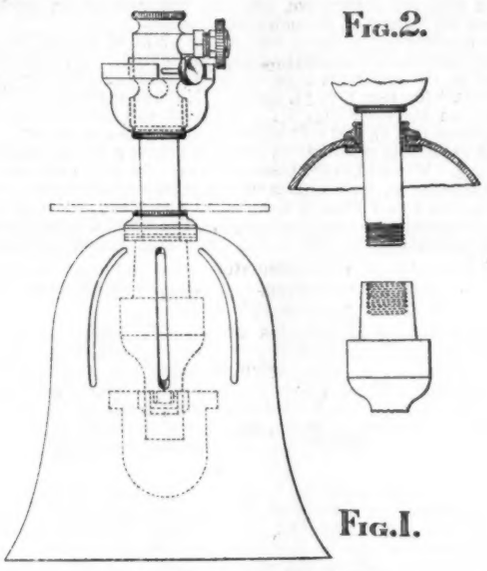


FIG. 2.

FIG. 1.

Kempton's Inverted Fitting.

The object of the present invention is to combine the globe and fittings in an improved and simplified manner; and to this end the arrangement is adopted as illustrated in fig. 1, a side elevation of an inverted incandescent gas burner and globe, and fig. 2, a part-sectional view showing the globe raised in relation to the burner tube and the burner nozzle detached.

The globe, which is preferably constructed of non-fusible silica or other refractory type of vitreous material, is directly combined with, or attached to, the mixing tube in such a manner that an intermediate gallery or fitting is unnecessary. The nozzle, which is formed of fire-clay, porcelain, or other suitable material, and adapted to support an incandescent mantle or mantles in the conventional manner, is preferably made slightly longer than usual and provided with an internally screw-threaded upper portion adapted to enable it to be secured to the mixing tube, and to co-operate with the collar of the globe to hold the latter in place. The globe may (although not so shown) conveniently be secured in position by clamping its upper edge between the under surface of the burner fitting and a flange or clamping nut provided on the upper screwed portion of the mixing tube; or (as shown) it may be left loose, enabling the globe to be raised up, as indicated in fig. 2, to give better access to the mantle.

The globe is provided with vertical slits or other suitable openings to permit the escape and circulation of the products of combustion, and also, if desired, with an additional reflector (such as is indicated in dotted lines in fig. 1) formed of enamelled iron, silica, or other fire-proof material. Conveniently the globe and burner may be secured to the lamp bracket or main fitting by screwing in the usual manner, though in some cases this connection may be effected by means of a bayonet joint. This joint could conveniently be formed below the usual gas-regulating screw and just above the air-regulating shield, which forms part of the improved fitting.

Condensers.—No. 191,644.

BLAKELEY, W., of Church Fenton.

No. 5725; Feb. 27, 1922.

The object of this invention is to provide a simple and efficient device for removing the hot air from, and cooling, the exterior surface of condenser tubes, thus increasing the cooling effect on the hot gases passing inside. In condensers of the ordinary type, currents of hot air arise and keep in close contact with the external surface of the tubes, and do not leave them until they pass beyond the top.

According to this invention, stationary baffles are provided for diverting hot air away from the tubes and allowing cold air to take its place. The condenser tubes may be of the oblong, or rectangular type; and in order to deflect the hot air, the broad sides may have mounted on them at intervals inclined baffle plates which may, for example, be constructed from pieces of angle iron, riveted or otherwise secured to the sides and extending from one edge to the other. If desired, the baffle plates may extend beyond one or both edges of the sides, and be connected by horizontal or inclined plates to deflect the heated air further away from the tube. By the invention it is claimed that increased efficiency is obtained by the external baffles inducing cold air to take the place of the hot air at suitable intervals through the full height of the tube.

Lighting Controllers.—No. 191,354.

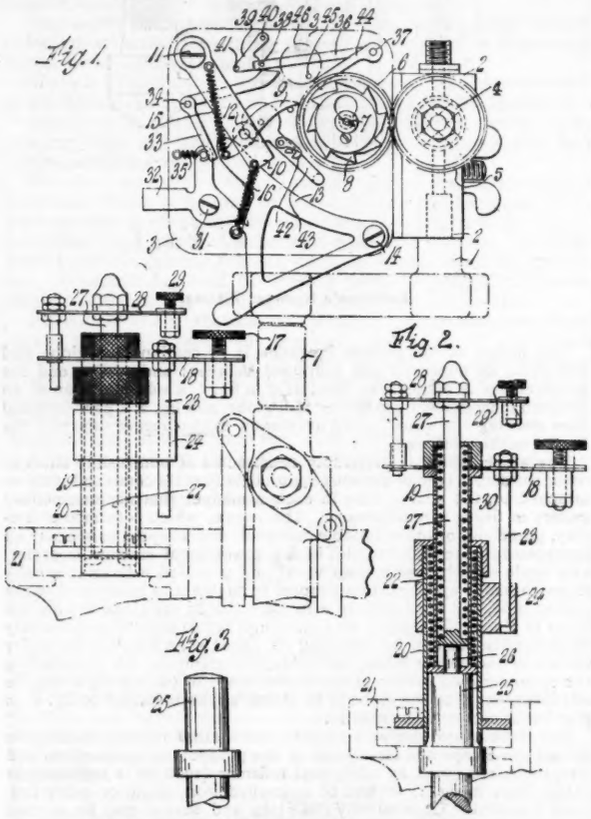
SOUTH METROPOLITAN GAS COMPANY and HARRIS, H. W., both of Old Kent Road, S.E. 15.

No. 31,485; Sept. 1, 1921.

This invention relates to improvements in apparatus for controlling the lighting and extinguishing of gas; the object being to provide improved means for turning the tap or switch on or off by hand, and also to provide means whereby, if the tap or switch be turned on by hand, the mechanism adapted normally to turn it on the first subsequent time is rendered inoperative, the next operation of the mechanism effecting the turning-off in the normal manner.

The modification is convenient in the event of fogs of longer or shorter duration, perhaps coinciding with nightfall. It is described as applied to the apparatus covered by specification No. 189,547 (see "JOURNAL" for Jan. 3, p. 39, and also No. 191,353 above). We reproduce an elevation (fig. 1), a sectional elevation of the tappet arrangement (fig. 2), and a detail of the hand-pole end (fig. 3).

1 is a gas-supply pipe, fast on which is a block 2 having attached to it a case 3. Mounted in the block 2 is a tap, the plug 4 of which controls a passage to a gas-burner, and is provided with a gear wheel 5 meshing with a gear wheel 6 mounted on a spindle 7, which is rotated by a spring motor governed by a clock. The wheel 6 is provided with ratchet mechanism, so that it can be rotated without affecting the spindle 7.



Improvement of the South Metropolitan Controller.

In order to rotate the plug 4 and turn the gas off or on by hand, as may be desired in the case of a fog, there is provided a pole carrying on one end a rod 25 of the form shown in fig. 3, which is inserted into the bevelled bore of the tube 20; the top of the rod 25 coming in contact with the end of the sleeve 19, which is thereby lifted against the spring 22—raising with it the spring arm 18 and tappet 17, which rocks the bell-crank lever 13 on its pivot 14. This latter comes against the roller 12 and moves the lever 10 and the pawl 9 a sufficient distance to cause the ratchet wheel 8 to rotate one-eighth of a revolution; thereby rotating the plug 4 through one-eighth of a revolution and turning on the gas, overrunning of the ratchet wheel 8 being prevented by the end of the lever 10. When these operations are repeated, the plug 4 will be rotated a further one-eighth of a revolution and the gas turned off again. When the wheel 6 is being rotated as above described, it will overrun the spindle 7 driven by the motor train, by means of the pawl and ratchet or other free-wheel mechanism (not shown).

The mechanism will now be described by means of which the gas can be turned on during the daytime, if desired owing to fog, for example, and it is thought that it will be unnecessary to turn it off again before nightfall. In this case means are provided to lock the motor train by the hand operated pole when this latter is moved so as to rotate the wheel 5 on the plug 4.

In order to effect this, the pole is provided with an extension 26 on the rod 25 (as shown in fig. 2) which engages a rod 27 carrying a spring arm 28 on which is mounted a tappet 29. In operation, when the rod 27 is raised, the bell-crank lever 32 is rocked by the tappet 29. This rocks the lever 33 and consequently the lever 36 from the position shown in fig. 1; the end of the lever 44 coming into the path of the pin 45, and the pin 38 on the lever 36 being engaged by the catch 39. When the time-setting lever (not shown) at lighting-up time comes into position to effect the release of the motor train, the wheel 46 of the motor train remains held by the lever 44 (which is in engagement with the pin 45 on the wheel 46); and when the time-setting lever 43, which normally shuts off the gas, comes into position to release the motor train, the tappet 42 moves the catch 39 out of engagement with the pin 38 on the lever 36 and allows this to drop. The end of the lever 44 falls clear of the pin 45, which allows the motor train to be driven when released by the time setting lever 43.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for Feb. 7.]

Nos. 2579 to 3305.

BASKERVILLE, C. H. V.—"Producer for gasifying bituminous, &c., fuels." No. 2755.
BERRY, J.—"Means for giving warning of gas escapes." No. 2865.
BLACKMORE, R.—"Gas, &c., cocks." No. 3237.
CASTLEMAN, F. M.—"Pipe joints." No. 3295.
COLEY, H. E.—"Manufacture of thorium, cerium, &c." No. 2894.
COSTER, A. V.—"Gas-producers." No. 3216.
CURTIS, C. G.—"Power plants comprising gas-engine and turbine." No. 2643.
ENDERSEN, J.—"Means for automatically supplying and cutting-off gas to burners for stoves, &c." No. 2981.
FILDES, T. S.—"Geysers, &c." No. 3104.
GLOVER, W. R.—"Coin-freed gas-meters." No. 2897.
HEYL, G. E.—"Distillation of oil shale, coal, &c." No. 2882.
HUNTER, C.—"Manufacture of combustible gases." No. 2892.
JACKSON, W. J. MELLERSH-.—"Apparatus for manufacture of gas." No. 2782.
LUCAS, S.—"Two-way valves." No. 3233.
MOORE, S.—See Hunter, C. No. 2892.
PRIEST, C. F.—"Vertical gas-fired kilns." No. 3173.
RIGBY, A. & T.—"Gas-heated washing-boilers." No. 2996.
SCOTT, R. S.—"Gas fires and stoves." No. 2987.
SMEDLEY, W.—See Lucas, S. No. 3233.
SMITH, K. H.—"Gas-taps, &c." No. 2795.
STARKEY, T. R.—"Distillation of oil shales, coal, &c." No. 3190.
SULZER FRÈRES SOC. ANON.—"Apparatus for cooling coke." No. 3156.
WESTERN GAS CONSTRUCTION COMPANY.—See Jackson, W. J. Mellersh-. No. 2782.
WOODALL, DUCKHAM, AND JONES (1920), LTD.—"Annular furnaces or kilns." No. 3197.

MISCELLANEOUS NEWS.

SOUTH SUBURBAN GAS COMPANY.

Annual Report.

In submitting the accounts for the year ended Dec. 31 to the annual meeting of the Company next Friday, the Directors will present the following report, signed by the Chairman (Mr. Charles Hunt).

Three reductions were made in the price of gas during the year, the lowest price in the Company's area being now 11½d. per therm, or 4s. 6·28d. per 1000 c.ft. This compares with 2s. 3d. per 1000 c.ft., which was the lowest pre-war price reached by this Company. The downward tendency of coal prices appears to have been arrested.

As compared with those of the previous year, the sales of gas show an increase of 3·66 p.ct., while the number of consumers has increased by 3770, and of cookers, gas-fires, &c., on hire, by 4158.

The Directors have acquired from the Trustees of Christ's Hospital about 100 acres of land at Abbey Wood, in the immediate vicinity of the gas-works site at Belvedere, but on a higher level, and therefore better suited for the erection of dwelling-houses for the workmen who may be employed there.

The accounts show that, after providing for all debenture and other nterest charges, and payment for the first half of the year of a statutory dividend at the rate of 6 p.ct. per annum, less income-tax, there remains a balance of £57,919, out of which the Directors recommend payment for the second half year of a dividend at the rate of 6 p.ct. per annum, less income-tax, carrying forward to the next account the sum of £25,285.

The Directors retiring by rotation are Sir J. Fortescue Flannery, Mr. Alexander Dickson, and Mr. John H. Boraston, who, being eligible, offer themselves for re-election. Mr. William G. Waller, Employees' Director, was returned unopposed. It is particularly gratifying to the Board to be able to make this announcement, having regard to Mr. Waller's long connection with the Company, and his valuable service as Employees' Director. Mr. E. D. Davey (Auditor) retires by rotation, and, being eligible, offers himself for re-election.

Improper Use of Gas.—When William Robson, of Prudhoe, was summoned at Hexham Police Court, on a charge of having improperly used gas belonging to the Newcastle and Gateshead Gas Company, Mr. T. A. B. Foster, prosecuting, said that because of the defendant's failure to pay his gas account, the supply was turned off on Dec. 29. In January it was discovered that the defendant was using gas; and he admitted that he had turned on the outside stop-tap. Defendant was liable to a penalty of £5, and a continuing penalty of 40s. a day. He had paid the outstanding account. The Bench imposed a penalty of 20s., and allowed two witnesses 5s. each expenses.

ALDERSHOT GAS, WATER, AND DISTRICT LIGHTING COMPANY.

Annual Meeting.

The Annual Meeting of the Company was held last Friday, at the Chief Office, Victoria Road, Aldershot—Mr. R. W. EDWARDS (the Chairman and Managing Director) presiding.

The SECRETARY (Mr. F. A. Ricketts) read the notice convening the meeting; and the report and accounts were taken as read.

The CHAIRMAN: Gentlemen,—This is our fifth annual meeting since Parliament granted us authority, in 1918, to hold meetings once a year, and I find quite a number of interesting items present themselves for incorporation in the annual address. On this occasion, I am hoping to abbreviate my remarks as much as possible, as I believe 1922 will be a turning-point to brighter conditions. After the unfortunate coal strike of 1921, many companies were left saddled with deficits for liquidation in 1922. I am therefore hoping that onwards, for a time, we shall not have those serious set-backs to deal with. I think most of you know that, during the coal strike, we maintained our supplies of gas, water, and electricity to the fullest. We did not take advantage of the privileges granted to us to lower the quality of our gas, but maintained it for a period of three months up to our standard—in fact, slightly above the statutory standard. This was done at great financial sacrifice. We bought coal from the Ruhr Valley—now so much talked of—from the Saar Valley, from Belgium, and from America, and we sought for it up and down the country from pit-heads; and some of it ought never to have been consigned as coal. Last, but not least, we purchased, at very high prices, foundry coke from South Wales and elsewhere, for the purpose of manufacturing carburetted water gas. We left no stone unturned; and what we did was only achieved by the co-operation of officers and men throughout the Company. We feel that there is no apology in mentioning to-day that this left us with a pretty heavy millstone round our neck. We had to meet that during the year 1922.

THE CAPITAL ACCOUNT.

In the first place, I turn to the capital account, which represents an authorized sum of £978,910 9s. 11d., of which there has been received to date £570,235 19s. 10d. After deducting £40,989 8s. 3d., added on consolidation under our 1909 Act, there remains a debit balance of £6688 8s. 11d. After allowing the depreciation shown of £10,427 5s. 10d., the net expended to date is £535,935 0s. 6d., or £23,487 6s. 10d. net spent for the year, which falls under the headings: Gas, to the extent of 70·8 p.ct.; water, 21·8 p.ct.; electricity, 7·4 p.ct. The expenditure during the year was allocated as follows: Works, 42·5 p.ct.; new mains and services, 52·5 p.ct.; meters, 3·4 p.ct.; and transformers, 1·6 p.ct. You will observe that our capital account is overspent, and that there will be a necessity to raise new capital; but the Directors have not yet decided as to the appropriate moment.

THE GAS BUSINESS.

We have been able to reduce our working expenses under various heads, and are passing on such savings to the consumers, so far as we can, in the shape of reductions in the price of gas. As mentioned in the printed report, we have already reduced the price of gas by the equivalent of 1s. 3d. per 1000 c ft. in the "A," "C," and "D" areas, and 1s. 6d. in the "B" area. The reason for the extra 3d. in the "B" area is due to an agreement made during the passing of our 1918 Act reducing the difference between "B" and "A" areas from 6d. to 3d. per 1000 c.ft. one year after the official termination of the war, which date was Aug. 31, 1922; but your Directors anticipated this by giving the consumers the benefit of the reduction, in that area, from and after the reading of the meters at Midsummer. We have considered matters very closely, and have decided further to reduce the price of gas by 1d per therm, or 5d. per 1000 c.ft., from and after the reading of the meters at Lady Day. This will undoubtedly be welcome news, and follows out the statement I made last year as to our policy in reducing the price of gas as frequently as circumstances may permit, for we are convinced that this is the surest means of extending our business, coupled with an efficient service and maintenance of a good quality. These reductions in the price of gas, including that proposed for Lady Day, will represent a saving to the consumers of about £35,000 per annum, and the increased dividends under the sliding-scale will be £900 per annum. I do not know whether any of you remember my remarks made on previous occasions, about the division of surplus profits under the sliding-scale; but here you have an instance of the proportion which is shed to the consumer and to the shareholder. I do not think anyone could possibly challenge such a small division as goes to the shareholder, when you realize that we are handing-back in the shape of reduced price £35,000 per annum, and that all that we receive extra in our dividends under the sliding-scale is £900. It is hoped that, as building costs come down, there will be a sustained development of building in our various districts. In fact, there is already substantial evidence in one or two localities of a considerable number of houses being erected—other than the general housing schemes. It is interesting to note that the popularity of gas, both for cooking and heating, is well maintained; and, as a light, it is undoubtedly preferred by many—especially in the middle and working class houses. The prospects are quite good. There is one matter that perhaps I ought to mention. For some years we have supplied gas in bulk to the War Department for lighting Wellington Lines. The contract is drawing to a conclusion, and it is the intention of the authorities to light these lines by electricity, from their own station. This would mean loss in consumption to us; but, fortunately, after some negotiations, an entirely new long-term contract has been made with the War Office for the supply of gas for heating and cooking in the various quarters throughout the whole of the Government establishments in that part of the Aldershot Command which is within the Company's statutory limits. This work will take some time to execute, and we are proceeding carefully, so as to give the utmost satisfaction to the Chief Engineer and his staff, as well as to the authorities in the Aldershot Command generally. I do not think I can profitably review any further details of this department, and will therefore turn to the

WATER DEPARTMENT.

In my address last year, I mentioned the operation of the Water Undertakings (Modification of Charges) Act, 1921, the object of which was to enable water undertakings to obtain a revision of their charges. Your Directors have very carefully considered this measure, and at the moment have not decided to take any advantage of it. We are making every effort to bring down our costs in all departments, and to effect the utmost economies. It has been a somewhat dull year in this department, owing to the absence of troops from the Aldershot Command, which has reduced the quantity of water supplied. I am pleased, however, to state that a new long-term contract has been concluded with the War Office for the supply of water in bulk, on terms mutually satisfactory. We have also decided to make a reduction in the price of water, by meter, to the extent of:

3d. per 1000 gallons for consumptions not	exceeding 50,000 gallons per quarter.
2½d. " " " " "	exceeding 50,000 gallons per quarter, and not exceeding 125,000 gallons per quarter.
2d. " " " " "	exceeding 125,000 gallons per quarter.

These reductions will undoubtedly be welcome to the consumer of water by measurement, and will operate from and after the reading of the meters for Lady Day next. The condition of our plant and works has been well maintained; and the outlook is promising.

ELECTRICITY.

While this department is developing satisfactorily, there is not, owing to the great expenses under which it has been operating, the amount of profit which we should like; but here, again, we are making every effort to effect economies, together with increased efficiency, and it is hoped that the department will be entirely self-supporting before long. We have extended our cables to Cove and Fleet, and are now supplying electricity in those districts.

GENERAL.

This concludes the individual review of our three departments. Our relations with our employees have been very satisfactory, and co-partnership is continuing to effect good work. Last year we held our first Co-Partnership Festival following the war, and the gathering was most successful. There has been a good deal of controversy in the gas world on the therm, and it would not be right for me to anticipate the decision of the Special Committee appointed by the Board of Trade to investigate this matter. I am quite sure, however, the gas industry has endeavoured to give the fullest information to the Committee to enable them to come to a wise decision. The profits of the three departments represent £35,692 19s. 3d., which, after the payment of interest and dividends, leaves a balance of £6189 12s. 1d. to be carried to profit and loss. With regard to the latter account, you will notice that we have brought-in a sum of £5503 18s. 1d., which represents arrears paid by the War Department under the new agreement for the supply of water, which dated back from Jan. 1, 1921. You will also notice, on the other side, an expense of £1428 8s. 8d. which your Directors will utilize for the purpose of writing-down the value of the investments on reserve fund account, to correspond with the market prices. I now formally move that the Directors' report, with the statement of accounts for the twelve months ended Dec. 31, 1922, be and are hereby adopted, and the dividends as therein recommended be and are hereby declared to be forthwith payable to proprietors.

Dr. STROYAN seconded; and, there being no question, the resolution was put and carried unanimously.

The CHAIRMAN remarked that the fact that, for the fourth or fifth year in succession, no comment had been raised on the accounts, was accepted by the Directors as a great compliment, having regard to the very trying times through which the Company had passed.

Mr. C. P. Crookenden, F.C.A., was re-elected a Director of the Company, and Mr. Lionel Maltby, F.C.A., was returned as Auditor. The fees of the Auditors were increased by £50 per annum, dating from Jan. 1, 1922.

A vote of thanks to the Chairman, Directors, and staff for their able conduct of the Company's affairs was passed with acclamation; and the CHAIRMAN and SECRETARY briefly responded, both referring to the co partnership scheme as a vital factor, not only in the experience of the staff and workpeople, but as contributing to the efficiency and stability of the business by the sense of co-operation which it undoubtedly produced.

Supply of Fittings by Gas Departments.—Mr. F. Down, at a meeting of the Milton Regis Urban District Council, said that because the Gas Department had sold gas-fittings, the Council had been accused of running another municipal trading concern. They had to make the works pay, and people were wrong in thinking they should only supply gas. Any local gas-fitter who bought fittings from the Gas Department had them at cost price, and the department made no profit out of that at all. If the department put in the fittings, they obtained the same profit as any tradesman. Their Provisional Order gave them power to supply fittings. They had never been guilty of cutting prices; and he considered that the sale of gas-fittings was perfectly legitimate.

Grantham Gas Company.—Mr. J. G. Thompson presided at the half-yearly meeting of the Company, when a report was presented by the Directors showing a profit on the six months' working of £3233. They recommended the payment of the statutory dividend of 5 p.ct., less tax, absorbing £1500, the transfer of £991 to the reserve fund, and the carrying forward of the balance. A further reduction in the price of gas was announced, to take effect from March 31 next, equal to 6d. per 1000 c.ft. The Chairman referred to the fact that for several half years the Company had not been able to pay their way, and the reserve fund had had to be drawn upon. There was now £3000 in this fund; but there was a debt owing to the bankers of £4000. At the beginning of the war they had a reserve fund of £10,000, and a large balance at the bank. The report was adopted; and the dividend as recommended was declared.

BRENTFORD GAS COMPANY.

Report of the Directors.

The Directors of the Company (the Chairman of which is Mr. Reginald J. N. Neville) will report as follows, for the year ended Dec. 31, at the annual meeting next Wednesday.

The accounts show a profit on the revenue account for the year of £177,256. After providing for the interim dividend to June 30, and fixed charges, and after placing £11,000 to the special purposes fund, there remains the sum of £55 607, which, with the balance brought forward, makes the amount of £103,622 available for dividends. The Directors recommend the declaration of dividends, subject to income-tax, at the rate of 5 p.ct. per annum on the 5 p.ct. preference stock, at the rate of £6 2s. p.ct. per annum on the "A" consolidated stock, and at the rate of £6 2s. 6d. p ct. per annum on the "B" consolidated stock; and that such dividends be payable on March 1.

Three reductions in the price of gas have been made since the previous year—a reduction of 1d. per therm as from the Christmas quarter, 1921; a reduction of 0·6d. per therm as from the March quarter, 1922; and a reduction of 2d. per therm as from the September quarter, 1922. The gas sold shows an increase of 4·07 p.ct. as compared with last year. The number of consumers is 128,837, as against 125,612 last year.

In accordance with the Act of Parliament, Mr. Reginald James Neville Neville, Brigadier-General Alexander Hugh Warlters Cowie, C.M.G., and Mr. Herbert Edward Griffith, by rotation, retire from the Board, and, being eligible, offer themselves for re-election. Mr. Monier F. Monier-Williams and Mr. Alfred Bevis, the Company's Auditors, offer themselves for re-election.

GAS REGULATION ACT APPLICATIONS.

The following further notices have appeared in the "London Gazette" with regard to applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDER.

Milton Regis Urban District Council.

The Council intend to apply for a Special Order to enable them to borrow money, and to regulate the conditions under which gas shall be supplied.

DECLARATIONS OF CALORIFIC POWER.

Alfreton Gas Company.—450 B.Th.U. (March 5.)

DIFFERENTIAL PRICES AT BLACKPOOL.

The welcome announcement has been made to consumers that gas charges at Blackpool are to be reduced at the end of the present quarter by amounts varying from 5d. to 7½d. per 1000 c.ft. The scheme is that the charges to ordinary consumers shall be reduced from 3s. 6½d. to 3s. 1½d. per 1000 c.ft., a reduction of 5d., and representing £13,792 per annum. In addition, ordinary consumers' gas charges are to be further reduced to 2s. 11d. per 1000 c.ft.—an additional 2½d.—for all gas used over 10,000 c.ft. per quarter. This concession will cost £2822 a year. Consumers who have prepayment meters will receive a reduction of 6d. per 1000 c.ft.; those now rated at 21 c.ft. for 1d., or 3s. 11½d. per 1000 c.ft., being rated at 24 c.ft. for 1d., or 3s. 5½d. per 1000 c.ft. This last-mentioned reduction equals £2748 a year, the whole totalling £19,362. The charges for power consumption are also reduced to 2s. 8½d. and 2s. 6d. per 1000 c.ft.

This decision was made by the Gas Committee (and subsequently confirmed by the Town Council) as the result of a statement by Mr. W. Chew, the Borough Gas Engineer and Manager. In this, he mentioned an actual profit on the past nine months of £20,400, chiefly as a result of the variation in economic conditions. Coal supplies not being contracted for allowed Mr. Chew to take advantage of spot offers on a falling market. There has been a better demand for residual products, and general working expenses are also down. The unusual profit is really needed in order to place an adequate sum to the reserve fund, which is at present depleted, and to augment the working balance and development fund. The expenditure of large sums will be necessary during the next three years.

On the subject of the differential charges introduced in the new scale, Mr. Chew stated that the time is now overdue for instituting a tariff that will increase business and stimulate the output of gas. "At the present time," he said, "the output has become stagnant. If this continues, the undertaking will soon be in a very unsatisfactory position. Although we are putting on considerable numbers of new consumers, which necessitate increased capital expenditure, they are mostly small consumers. This class of consumer is not profitable to the department, and becomes a surcharge on the larger consumer. This necessarily means a higher price for gas all round, in consequence of the increasing number of small consumers not covering their own standing charges. The consumption of larger users is being reduced in many instances owing to suitable tariffs being offered by the electricity department's tempting low rates for large consumption, and our flat rates give us no competitive reply. On a similar basis we should be selling gas to small users at 4s. 6d. per 1000 c.ft., and large users 1s. 6d. per 1000 c.ft." Mr. Chew considers it is an opportune time to give some inducement to the remunerative consumers to increase their consumption. The average consumption per consumer is 10,000 c.ft. per quarter, or 40,000 c.ft. yearly. Dividing the consumers into two classes, the one using above 10,000 c.ft. per quarter, and the other using below, the smaller yields little if any profit, owing to standing charges; and the larger one using up to 750,000 c.ft. per quarter, makes the major part of the profit. The differential charge proposed is only small; but it marks a definite commencement towards a more elastic system of charging.

GAS OR ELECTRICITY FOR HOUSING SCHEMES.

It was reported by the Housing Committee of the London County Council at the meeting on Tuesday last week that they had approved the installation of gas for lighting and cooking purposes in Bullen House, Collingwood Estate (Brady Street Scheme), and had accepted the offer of the Gas Light and Coke Company to carry out the work, at a charge of £3 a tenement.

Mr. PERCY HARRIS, M.P., moved "That the Council regrets the decision arrived at by the Housing Committee, under which electric light is not installed in Bullen House." The action of the Committee, he said, was a retrograde step, especially when one realized that, from the very nature of the construction of block-dwellings, the people living in them had to use artificial light to a much greater extent than on a cottage estate. In the Bethnal Green Borough Council's block-dwellings, not far from Bullen House, the cost of installing electricity and gas worked-out at something like £13 per tenement. He admitted that £3 a tenement in respect of gas was a very low figure; and he would like to know whether it included appliances.

Lieut.-Colonel LEVITA (the Chairman of the Housing Committee) thought it was most regrettable that electricity should be so expensive in London that they had not been able to use it. He had set up a Committee to inquire into the question of electricity *versus* gas; and the Architect and himself had inspected block-dwellings abroad. Mr. Harris and others who advocated low rents in the Brady Street area ought not to expect the Council at the same time to spend £13, as against £3, for lighting and cooking. It was purely a question of cost.

Mr. Harris's amendment was carried.

LIGHTING OF EDUCATIONAL INSTITUTIONS.

Gas or Electricity.

The report of the Education Committee which came up for consideration at last week's meeting of the London County Council contained some reference to gas or electricity for the lighting of educational institutions. Some months ago the Council instructed the Committee to consider and report whether, "in the interest of economy, health, and convenience, electricity should be substituted for gas in schools where gas is already installed." The Committee reported that during the past two-and-a-half years they have received a number of applications from the managers of schools for the substitution of electric lighting for existing gas installations, but in view of the prevailing financial conditions have felt bound to decline them. It is, however, the Council's practice, as a general rule, to instal electric light in new and remodelled schools. The Committee have considered reports by the Council's officers on the relative merits of gas and electric lighting, but, bearing in mind the present financial situation, "were not prepared to recommend any action in the direction of substituting electric lighting for gas lighting in those schools at present illuminated by gas."

Mr. HERBERT MORRISON moved that the report be received with the exception of the paragraph referred to, on the ground that the Committee had not dealt with the matter in a manner adequate to its importance in the public interests. Reports of a valuable character from the Architect, Medical Officer, and other officers of the Council, appeared to have been ignored. He suggested that they should consult with the Illuminating Engineering Society and the Institution of Electrical Engineers, and get the benefit of their advice.

Mr. SAMUEL MARCH, M.P., in seconding, complained of the bad lighting in East-End Schools, notwithstanding the frequent representations of teachers and managers that electricity should be substituted for gas. The Committee should have reported as to the difference between the price of electric light and gas in schools, or the cost of transference from one to the other.

Sir CYRIL JACKSON (the Chairman of the Education Committee) said that the present state of the Council's finances would only allow them to put electric light into new buildings, and not to change the existing method. In these circumstances, it was not worth while to obtain the opinion of outside experts and go further into the question. It was not yet proved that electric light was a great improvement on gas. The Medical Officer had said that gas and electric light were going neck and neck in improvements.

The motion was defeated on a division by 83 votes to 36.

Fatality at a Birmingham Gas-Works.—It was stated at an inquest in Birmingham on the body of William Pincott, a labourer at the Nechells Gas-Works, that deceased had for some years been an oiler of machinery, and was a competent worker. He was found dead, caught in the shafting of machinery which he had been oiling in the retort-house. The motor was working, and the shafting running. The shift foreman stated that explicit instructions were given not to oil machinery while it was in motion; and tight-fitting overalls had been issued to Pincott. The Coroner returned a verdict of "Accidental death."

Bristol Gas Company.—At the annual meeting to-morrow, the Directors will report that the accounts for the year ended Dec. 31 are considered satisfactory. There has been a further increase in the sales of gas during the year, and the output constitutes a record. The Bristol Gas (Charges) Order, 1922, made by the Board of Trade under the Gas Regulation Act, came into operation during the year, and the new method of charge was introduced in the September quarter. During the year reductions were made each quarter in the price of gas, bringing the charge from 4s. 6d. per 1000 c.ft. to 8½d. per therm, equal to 3s. 4·8d. per 1000 c.ft., a total reduction of 1s. 1·2d. per 1000 c.ft. A further reduction to 8d. per therm (3s. 2·4d. per 1000 c.ft.) has been announced, dating from Jan. 1. The Directors recommend that a dividend be declared for the half year ended Dec. 31 at the rate of 5 p.ct. per annum on the nominal capital of the Company entitled to dividend, subject to the deduction of income-tax.

EXTENDED USES FOR COAL-TAR DYES.

There have been references at various times to the use of coal-tar dyes in many directions which the early workers probably never contemplated; and a good deal of light was thrown upon the newer work of this nature in a paper read before the Royal Society of Arts on Wednesday, Jan. 31, by Messrs. T. H. Fairbrother and Arnold Renshaw. The work in question is related to the antiseptic properties of coal-tar dyes, and the results achieved are of far-reaching importance. The title of the paper was "The Relation between Chemical Constitution and Antiseptic Action in the Coal-Tar Dyes." In quite general terms it has been found that some dyes possess destructive action upon bacteria and protozoa, while others do not, and that the dyes exert a selective action on minute forms of life. This selective action has, even at this comparatively early stage of the work, been found to have a practical application in many directions—such as agriculture, sewage purification, and preventive medicine.

A large part of the paper was devoted to the purely chemical aspect of the work and details of the many experiments carried out, the object of the authors being to show how antiseptic action varies with chemical constitution in each particular group of dyes. It is admitted that, in seeking for a possible explanation of the antiseptic action, it is possible that other factors than mere chemical structure will have to be studied, inasmuch as the chemical formulæ assigned to chemical bodies are but rough approximations to the truth. It is pointed out, however, that if a dyestuff has a colloidal nature in solution, it is not likely to be an active antiseptic, and that it is not sufficient for a body to have a certain structure which contains antiseptic groups alone; it must also have a physical condition which will enable those antiseptic groups to be brought into play. It is also suggested that antiseptic action is dependent upon the formation of a compound between the dye base and the cell of the molecule of the organism. Again, the experimental work has shown that it is not possible to connect antiseptic action with intensity of colour.

Many instances are given in the paper of the action of various dyes in different circumstances, and of the manner in which bacteria and protozoa can be killed. In agriculture especially, the results are likely to have far-reaching effect; and it gives the gas industry another sphere of added usefulness to the nation as a whole, apart from the supply of fertilizers. Agriculture is expected to make great use of selective sterilization by means of coal-tar dyes. The difficulty hitherto has been partially to sterilize the soil or free it from protozoa without harming the nitrifying bacteria. Experiments have been made in this direction with toluene and arsenious acid, but without any great measure of success; and the results obtained by the authors lead them to believe that much more positive results could be obtained by using certain of the dyes of the oxazine class. Work in this sphere offers great possibilities to the agricultural chemist and bacteriologist.

Similar remarks apply to the purification of sewage; and details of two experiments are given in the paper, using dyes of the oxazine class, which appeared to deal effectively with the trouble of bulking due to the growth of bacteria. Work is now in hand to ascertain the exact conditions for obtaining the biggest decrease in bulking, coupled with the smallest interference with the rate of purification in the tank. It is upon preventive medicine, in relation to the use of coal-tar dyes, that the authors have concentrated most of their attention during the past few years; and it is natural that most progress has been made in this sphere. It is not within our province to go into the details; but one important point may be mentioned, and that is the aid the work already done is expected to give to the synthesis of new bodies which will have even greater antiseptic action than those already referred to.

TRADE NOTES.

The Parker Producer Gas Plant.

We are informed by Mr. Maurice Steinman-Bezencenet, of No. 13, Well Street, E.C., that the Parker producer gas plant (a small gas-producing plant that enables motor lorries and tractors to be propelled by means of gas obtained from wood charcoal or coke instead of petrol) is now on the market, and is being regularly shipped to the Colonies and Oversea countries. The Parker plant is extremely simple, having no moving parts; and it can be readily fitted to any existing motor lorry without any alteration to the chassis or engine. The fuel used in the Colonies is wood charcoal, and the average fuel consumption for a 3-ton lorry (total weight 5 tons) is a little over 1¼ lbs. per vehicle mile, worth about ¼d.—thus showing a great saving over petrol. The Parker plant is an English invention, and is made in England.

Non-Corrodible Pipes.

The rapid corrosion of metal flue-pipes used with gas-heating apparatus is a matter which has become of increasing importance of late years, and the introduction of pipes made of a material both light in weight and non-corrodible in character should prove of importance to the gas world. The claims made by the British Uralite and Cellactite Works for their new material are therefore of more than usual interest. We understand that the Gas Light and Coke Company, the Tottenham District Light, Heat, and Power Company, and similar undertakings, are large and constant users, which would indicate that their claims have a very solid foundation. The new material is the result of extensive research on the part of the manufacturers, and we learn that it has satisfactorily passed the stringent tests to which they have submitted it.

Fatal Accident at the Toronto Gas-Works.—Ten employees of the Toronto Gas Consumers' Company are reported to have lost their lives in an accident at the works, while others are suffering from the effects of gas poisoning. It appears that a new valve in connection with a 20-in. main was being installed in the valve-house, when there was a sudden rush of gas, which overwhelmed men who were in the chamber and some of those who attempted to rescue them.

THE NORTH-EAST COAST COAL TRADE.

From Our Own Correspondent.

There are few striking features to report from the Newcastle market this week. The tone has been firm and steady throughout, due chiefly to the extraordinary demand for coking coal. This is attributed mainly to the French industrial works in Alsace and Lorraine, which evidently are not particularly optimistic about supplies from the Ruhr during the next three or four months. Quite ordinary qualities of coking have done 27s. 6d. f.o.b.; and this naturally has given a strong tone to the whole market.

Owing to the weather, and to tonnage being late in consequence, there have probably been odd lots of gas available for sale during the week, though not in any quantity. Apart from these exceptional bargains, which are always liable to recur in stormy weather, the position remains the same—practically sold out for this and next month. At the end of the week, the price may be nominally 26s. to 26s. 6d. for best qualities. There are signs, however, that collieries would be more willing to quote for forward business over the year than they have been for the last few weeks, and the basis would probably be somewhere about 25s. for regular business. Seconds are said to have been done on these lines at 23s. 6d. to 24s.

The demand for coke of all descriptions has been strong throughout, and gas coke has been sold up to 32s. 6d. f.o.b. for export.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From a Local Correspondent.

The past week has seen little or no alteration in the inland market for gas coal. There was a greater demand from abroad, with a consequent increase in prices. What exporters describe as the "newspaper demand" in regard to Germany has not yet materialized. The opinion is expressed that Germany cannot find the sterling for the coal reported to be on order. The present rates of exchange in France and Belgium prevent these countries purchasing all they would like to do. The mildness of the weather is contributing to a decreased supply. There is no alteration in the price of screened coal for gas purposes. Gas-works on the whole cannot take up the full quantities owing to the weather, and, therefore, collieries with a surplus are disposing of their products in other directions. There is not a great demand for gas coal for export, prices ranging from 25s. 6d. to 26s. for screened gas coal f.o.b. Hull. Gas coke is weak owing to the mild weather, and there is plenty available for inland consumption, but not for export, owing to the scarcity of wagons. At Barnsley, on Friday, gas coal continued to be in strong request, with best screened sorts in full demand. The market activity in furnace coke makes it difficult to obtain an adequate tonnage of good coking slack. The production of coke is about at the maximum, with values showing great firmness at about 34s. per ton f.o.b. At Sheffield, on Friday, gas coke was firm at recent figures. Furnace and foundry coke both occupied a strong position, and consumers found difficulty in obtaining full tonnages. At the Leeds Coal Exchange gas coals remained steady; but inquiries for shipment were not so pronounced as in the previous week; and the opinion was expressed that Germany had not purchased from Yorkshire the quantities reported. The coal trade generally in these countries has been forced back by the action of collieries in attempting to increase their prices to the detriment of the English consumers, who cannot afford to produce their finished articles, particularly in regard to iron and steel, at present prices if they have to pay more for their coals. In Lancashire, the demand from the cotton trade remains on the small side.

COAL TRADE IN THE MIDLANDS.

From a Local Correspondent.

The market has become so confused that those best able to weigh the various factors confess themselves perplexed. A great deal depends, of course, upon the export demand. Whether the export demand is going to increase or decrease depends very much upon events in the Ruhr; and with the conflicting currents that are at work in that arena, it is impossible to form a judgment on the outcome. There is nevertheless a feeling that the crisis may subside as quickly as it has arisen. Accordingly, consumers of gas coal who are under no pressure in regard to supplies for the immediate future are not disposed to be stampeded by the advance which collieries are making in their prices. This is an attitude that accords with the view taken of the situation by some of the most experienced factors. The present speculation is that there is a very good chance of annual contracts being renewed in June on terms not less favourable than those which have ruled since last summer. There will be an opportunity, of course, of reviewing contracts, or many of them, next month. This is a matter which will be determined by the course of events between now and the review date. As to buyers who have contracts which expire in March, they are naturally made very anxious when they find South Yorkshire collieries asking as much as 2s. 6d. more and Derbyshire collieries following at some little distance. They cannot see the end of it. In a few cases buying commissions are out. They relate generally to the smaller undertakings. Managements of the big gas-works are watching events, and where any particular class of coal needs augmentation they deem it good policy to buy only from hand to mouth. They are averse from speculative moves which would assist inflation.

A Further Reduction at Sunderland.—The gratifying announcement has been made by the Sunderland Gas Company of a further reduction of 6d. per 1000 c.ft. in the price of gas from the quarterly readings of the meters in November and December last, making a total reduction since November, 1921, of 1s. 6d. per 1000 c.ft. The gross price is now 2s. 6d. per 1000 c.ft. for lighting, heating, and cooking, less discounts ranging from 1d. to 6d. according to consumption, and 2s. 4d. for power purposes, less discounts ranging from 1d. to 7d. The new price of 2s. 6d. per 1000 c.ft. is equivalent to 6d. per therm.

CURRENT SALES OF GAS PRODUCTS.

Tar Products in the Provinces.

Feb. 12.

The average values for gas-works products during last week were: Gas-works coal tar, 89s. 3d. to 94s. 3d. Pitch, East Coast, 147s. 6d. to 152s. 6d. f.o.b. West Coast—Manchester, 142s. 6d. to 147s. 6d.; Liverpool, 143s. 6d. to 148s. 6d.; Clyde, 145s. to 150s. Benzole 90 p.ct., North, 1s. 7½d. to 1s. 8d.; crude 65 p.ct. at 120° C., 1s. 0½d. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 8½d. Toluole, naked, North, 1s. 11d. to 2s. nominal. Coal tar crude naphtha in bulk, North, 8½d. to 9d. Solvent naphtha, naked, North, 1s. 8d. to 1s. 10d. Heavy naphtha, North, 1s. 6d. to 1s. 8d. Creosote, in bulk, North, liquid, 7⅝d. to 8¼d.; salty, 7d. to 7½d. Scotland, 6½d. to 7d. Heavy oils, in bulk, North, 7d. to 7¾d. Carbolic acid, 60 p.ct., 2s. 6d. to 2s. 8d. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

FROM A MARKET CORRESPONDENT.

Bye-Products Trade.

There is very little to report in tar products this week. Pitch maintains its strength; and carbolic acid crystals are wanted, advancing to over 9½d. per lb. Crude carbolic acid remains without change; but cresylic acid is rather lower. Creosote is a trifle dearer; but refined naphthalene and heavy naphthas have fallen away.

The range of quotations is as follows:

Benzole: 90% London 1s. 8d., North 1s. 7d.

Crude Tar: 77s. 6d. to 80s. Refined, 40s. per barrel (free) on rail.

Pitch: London, 135s. to 140s. per ton; East Coast, 145s. per ton; West Coast, 120s. to 127s. 6d., with Manchester 122s. 6d. per ton, and Glasgow 125s. per ton; South Wales, 137s. 6d. per ton.

Solvent Naphtha: London, 1s. 7d. Provinces average 1s. 6d. per gallon.

Crude Naphtha: Naked, 9d. per gallon.

Heavy Naphtha: 1s. 7d. per gallon.

Naphthalene: Refined, £15; inferior, £13; crude, £4 to £7 10s., according to quality.

Toluole: Naked, 2s. North, 1s. 11d.

Creosote: London, 8d.; North, 7½d.

Anthracene: 40-45%, 4d. per unit per cwt.

Pyridine: 12s. per gallon.

Aniline Oil: 11d. per lb., drums extra.

Aniline Salts: 10d. per lb.

Cresylic Acid: 95%, 2s. 2d. to 2s. 5d.; 97-99%, 2s. 6d. to 2s. 8d. per gallon *ex* works London, f.o.b. other ports.

Carbolic Acid: Crude 60%, 2s. 4d. per gallon; crystals 40%, 9d. to 9½d.

Salicylic Acid: Technical, 1s.; B.P., 1s. 6d. per lb.

Xylol: Pure, 2s. 9d.; commercial, 2s. per gallon.

Sulphate of Ammonia.

An advance in quotations is announced for March deliveries onwards. This material, however, still remains comparatively cheap against nitrate of soda. Export business shows signs of expansion; and those traders who wish deliveries in time for current season's use should place orders without delay.

Bournemouth Gas and Water Company.

In their report for the year 1922, which will be presented at the annual meeting next Friday, the Directors state that business continues to expand. As from July 1, the price of gas was reduced from 12d. to 11·4d. per therm, and from Michaelmas to 10·4d.; and the Directors have announced a further reduction to 9d. per therm, to take effect from Jan. 1 last. The increase of 33⅓ p.ct. in water charges authorized by the Company's Order of 1921 was reduced from Michaelmas last to 25 p.ct. The supplies of both water and gas have been satisfactorily maintained; and the increased sales of gas render necessary further extension of the Company's plant and mains, while additional works for water storage and filtration are also in progress. The shareholders will be asked to sanction the creation and issue by the Directors, as and when required, of additional share capital to the amount of £100,000, and of further borrowing powers to the extent of £33,333. An interim dividend at the rates per annum of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and £7 12s. 6d. on the original shares was paid for the half-year to June; and the Directors, after placing £20,000 to the Reserve Fund, now recommend the payment of a dividend for the second half year at the rates per annum of 6 p.ct. on the preference shares, 7 p.ct. on the "B" shares, and 8 p.ct. on the original shares—the dividend on the original shares being the statutory dividend determined by the price of gas. All these dividends are subject to deduction of income-tax, and if approved will leave to be carried forward the sum of £40,375. The Directors regret to report the death of their colleague the Right Hon. Sir Daniel F. Goddard, who had been a Director since 1916; and they desire to place on record their appreciation of his valuable services. To fill the vacancy thus caused, they have elected Lieut.-Col. Harold W. Woodall, C.I.E., M.Inst. C.E., whose knowledge and past experience as Engineer and General Manager of the Company they are sure will be of great value.

Mr. Thompson, in the Stockton Town Council, described the price of gas as excessive, whereupon the Chairman of the Gas Committee (Alderman J. M'Naughton) observed that there were reasons for this which the Council knew. He remarked that at the end of the present quarter he had no doubt the Committee would be able to recommend a substantial decrease.

Special Notice

may we direct your attention to the useful reminders given on each monthly "full" page advertisement in our recently issued "Desk pad"

R. & J. DEMPSTER, LTD. MANCHESTER

STOCK MARKET REPORT.

THE Stock Exchange has had a chequered week—alternations of anxiety and cautious abstention followed by brighter phases and firm prices. Home Government issues were almost unchanged on final basis. Home Rails were mostly firm, and Canadians and Argentine in good demand. The Foreign Market had some strong points; French, Belgian, Mexican, and Chinese being conspicuous. Industrials as a class were firmer, and Oils had a much better week.

Business in the Gas Market showed a good increase both in the aggregate of transactions and in the array of issues in which business was done. The general tendency was satisfactory. In the London group, Gas Light three issues were quoted *ex div.* at a slight advance, and South Metropolitan and Commercials were steady. In the Suburban and Provincial department, Plymouth rose 3, Portsea "C" 2, South Suburban 1, and Wandsworth "C" 1; but Alliance and Dublin was 2 lower, and Brentford "A" and "B" fell 2 each. Abroad, Imperial Continental fell 2; but the debenture was ¾ better *ex div.*

The following transactions in gas during the week were recorded: On Monday, Brentford "A" 97, ditto "B" 99½, Continental Union 17, 17½, European 8, 8¼, Gas Light ordinary 93½, 94, 94¼, 94⅜, 94½, 94¾, 95, ditto 3½ p.ct. maximum 64, 65, ditto 4 p.ct. preference 79, ditto 3 p.ct. debenture 60, Imperial Continental 152, 153, ditto 3½ p.ct. debenture 76½, Primitiva 5 p.ct. preference 50s., 51s., 51s. 10½d., San Paulo 5 p.ct. debenture 37, 38, South Metropolitan 95, 95¼, 95½, South Suburban 101⅜, Tottenham "A" 116, Wandsworth "B" 102½, ditto "C" 91½, Brentwood 10 p.ct. original 100. On Tuesday, Alliance and Dublin 62, Brentford "A" 97, 99, Gas Light ordinary 93¾, 94½, ditto 3 p.ct. debenture 61½, Imperial Continental 151, Liverpool 7 p.ct. preference 105½, 106, Primitiva 5 p.ct. preference 51s. 6d., Sheffield "A" 97½, South Metropolitan 94½, 95, 95¼, Barnet "D" 89, Bristol 5 p.ct. debenture 76½, ditto 4 p.ct. debenture new 75½, Uxbridge and Wycombe 5 p.ct. cons. 84½. On Wednesday, Bombay 97s. 6d., British 34⅜, Commercial 4 p.ct. 95½, European 8, 8⅜, Gas Light ordinary 93⅜, 94, 94½, 95⅛, ditto 4 p.ct. preference 79, ditto 3 p.ct. debenture 60½, 61, 61½, Hastings and St. Leonards 3½ p.ct. 77½, Primitiva 5 p.ct. preference 49s. 4½d., 50s., 52s., South Metropolitan 94½, 94⅝ 95, ditto 3 p.ct. debenture 59½, ditto 6½ p.ct. debenture 105½, Brighton and Hove 7 p.ct. debenture 103, Folkestone 7 p.ct. debenture 102, 103, Harrow and Stanmore 5 p.ct. 83, Redhill 5 p.ct. "B" 72, Uxbridge and Wycombe 5 p.ct. cons. 85, Colonial Association 17s. 4½d., ditto 7 p.ct. preference 15s. 6d. On Thursday, Alliance and Dublin 63½, Bombay 97s. 6d., and 92s. 6d., 93s. 9d., *ex div.*, Brentford "B" 98, Brighton and Hove "A" 123⅜, British 35½, Cape Town 4½ p.ct. debenture 74, Commercial 3½ p.ct. 95½, Continental Union 20, 21, ditto 7 p.ct. preference 57½, 58½, European 8, Gas Light ordinary 91½, 91¾, 92, 92⅛, 92¼, 92½, 92⅜, *ex div.*, ditto 3½ p.ct. maximum 63¾, 63⅞, ditto 3 p.ct. debenture 60½, 61, Imperial Continental 151, 153½, Portsea "C" 99½, Primitiva 13s., 14s., ditto 5 p.ct. preference 49s. 6d., 50s., South Metropolitan 94⅜, 94⅝, South Suburban 100, Harrow and Stanmore 5 p.ct. 86, North Middlesex 5 p.ct. preference 90¾, Colonial Association 17s. 7½d., ditto 7 p.ct. preference 15s. 9d. On Friday, Alliance and Dublin 61½, 62, 62⅜, ditto 4 p.ct. debenture 62½, 63½, Brentford "A" 97½, ditto "B" 97½, ditto 4 p.ct. debenture 75, Brighton and Hove original 166, 167½, ditto "A" 122½, British 35½, Continental Union 19½, 21, ditto 7 p.ct. preference 58½, European 8, 8⅜, Gas Light ordinary 91⅜, 92, 92⅛, 92⅛, 92⅜, 92⅝, 94½, Hongkong and China 6⅜, Imperial Continental 150½, 152, Monte Video, 50, 50½, 51, Newcastle 83, Oriental 97½, 98, Portsea "C" 99½, Primitiva 14s., ditto 5 p.ct. preference 49s., 50s. 6d., South Metropolitan 94⅜, 95, 95¼, 95½, South Suburban 100, 101, Swansea 6½ p.ct. debenture 101¾, 101 13/16, 102 5/16, Tottenham "B" 100½, 101⅜, Brighton and Hove 7 p.ct. debenture 102, British (Norwich) 3½ p.ct. debenture 60, Cape Town 5 p.ct. debenture 76⅜, 77¼, Woking 5 p.ct. "C" preference 82.

In the Money Market, the course was variable; but for the most part there was a good steady demand, and at one time rather a shortage. Discount rates were stiffish throughout. Silver closed at about opening figure. The Bank of England rate was 3 p.ct., as fixed on July 13.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Dividend.	NAME.	Closing Prices, July 30, 1914.	Present Prices.	Lowest and Highest Prices of Transactions.
£			p.c.					
131,978	Stk.	—	—	—	Aldershot 5 p.c. max. C.	..	76—81	...
182,049	,,	Aug. 24	4	4%	Do. 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Oct. 5	2½	5%	Alliance & Dublin Ord.	59—64	60—65	61½—63½
374,000	,,	Jan. 11	4	4%	Do. 4 p.c. Deb.	76—79	60—65	62½—63½
280,000	5	Oct. 19	7½	4/-	Bombay, Ltd.	5½—6½	4½—5	92/6—97/6
100,000	5	Aug. 10	16	7½%	Bourne-mouth Gas and Water { 5 p.c.	..	11—12	...
383,110	10	,,	7	7%	Bourne-mouth Gas and Water { B 7 p.c.	15—15½	11—12	...
115,000	10	,,	6	6%	Bourne-mouth Gas and Water { Pref. 6 p.c.	13½—14	9—10	...
162,065	—	Dec. 29	—	4%	Bourne-mouth Gas and Water { 4 p.c. Deb.	..	72—76	...
992,045	Stk.	July 27	14	6½/-	Brentford A Consolid.	261—266	97—100	97—99
734,920	,,	,,	11	6½/3	Do. B New	204—209	97—100	97½—99½
55,000	,,	,,	5	5%	Do. 5 p.c. Pref.	109—111	82—87	...
221,400	,,	Dec. 14	4	4%	Do. 4 p.c. Deb.	91—93	75—80	75
214,775	,,	Aug. 24	11	11½%	Brighton & Hove Orig.	208—213	165—170	166—167½
244,200	,,	,,	8	8½%	Do. A Ord. Stk.	154—159	120—125	122½—123½
1,287,500	Stk.	July 28	5	5%	Bristol 5 p.c. max.	..	95—96	...
530,000	20	Oct. 5	12½	22/6	British	44—45	34—36	34½—35½
10,000	10	Dec. 29	—	7/-	Do. 7 p.c. Pref.	..	10½—11½	...
120,000	Stk.	June 29	4	4%	Do. 4 p.c. Deb. Stk.	88—90	75—80	...
245,771	,,	Dec. 29	4	4%	Buenos Aires 4 p.c. Deb.	85—87	53—58	...
100,000	10	Nov. 2	—	—	Cape Town & Dis., Ltd.	1½—2½	6½—7½	...
100,000	10	Oct. 19	—	—	Do. 4½ p.c. Pref.	4—6	6—7	...
100,000	Stk.	Dec. 29	4½	4%	Do. 4½ p.c. Deb. Stk.	70—75	71—76	74
237,860	,,	,,	—	7½%	Cardiff 7½ p.c. Deb.	..	103—104	...
157,150	,,	Feb. 26	5	5%	Chester 5 p.c. Ord.	108—110	..	...
1,513,280	,,	July 27	5/9/4	56/-	Commercial 4 p.c. Stk.	106—108	95—98	95½
360,000	,,	,,	5½	55/-	Do. 3½ p.c. do.	103—105	95—98	95½
475,000	,,	Dec. 14	3	3%	Do. 3 p.c. Deb. Stk.	69½—71½	55—60	...
800,000	,,	Dec. 15	4	—	Continental Union, Ltd.	76—79	17—23	17—21
200,000	,,	Dec. 14	7	4%	Do. 7 p.c. Pref.	115—118	55—60	57½—58½
660,000		Sept. 1	—	6%	Croydon sliding scale.	..	96—101	...
284,975		,,	—	5%	Do. max. div.	..	80—85	...
492,270	Stk.	—	6	4½%	Derby Con. Stk.	123—125	..	...
55,000	,,	—	4	4%	Do. Deb. Stk.	102—104	..	...
209,000	,,	Oct. 5	—	4%	East Hull 5 p.c. max.	..	..	...
2,002,180	10	Jan. 25	10	5/0	European, Ltd.	17½—18	8—9	8—8½
16,298,975	Stk.	Feb. 8	4/17/4	52/-	Gas Light { 4 p.c. Ord.	98—102	91—93*	91½—95
2,600,000	,,	,,	3½	35/-	Gas Light { 3½ p.c. max.	76—79	62—64*	63½—65
4,062,235	,,	,,	4	4%	Gas Light { 4 p.c. Con. Pref.	96—99	76—79*	79
4,674,850	,,	Dec. 14	3	3%	Gas Light { 3 p.c. Con. Deb.	72½—74½	59—62	60—61½
130,000	,,	Dec. 11	10	10%	Gas Light { 10 p.c. Bonds	..	..	...
—	—	—	—	—	Gas Light { 7½ p.c. Ilford Deb	..	..	...
82,500	,,	Sept. 21	5	65/7½	Hastings & St. L. 5 p.c.	..	95—100	...
258,740	,,	,,	3½	50/7½	Do. 3½ p.c.	87—89	77—80	77½
70,000	10	May 18	11	7½%	Hongkong & China, Ltd.	16½—16¾	6—7	6⅜
86,600	Stk.	Aug. 24	9	9½%	Hornsey 7 p.c.	..	127—132	...
1,976,000	,,	Nov. 16	9	4½	Imperial Continental	150—160	151—156	149—152
404,800	,,	Feb. 8	3½	3½%	Do. 3½ p.c. Deb. Red.	84—86	75—78*	76½
235,242	,,	July 27	6¾	6¾%	Lea Bridge Ord. 5 p.c.	119—121	95—100	...
2,498,905	,,	Feb. 26	10	37/6-	Liverpool 5 p.c. Ord.	..	..	...
600,000	,,	Sept. 21	—	7%	,, 7 p.c. Pref.	..	105—107	105½—106
165,736	,,	Aug. 10	7/5/6	87/3	Maidstone 5 p.c.	..	87—92	...
63,480	,,	Dec. 29	—	3%	Do. 3 p.c. Deb.	..	53—58	...
75,000	5	June 29	6	6%	Malta & Mediterranean Met. of Melbourne { 4½ p.c. Deb.	4¼—4½	3¼—4	...
250,000	100	Oct. 2	4½	4½%		99—101	97—100	...
541,920	Stk.	Nov. 30	4	4%	Monte Video, Ltd.	11½—12	50—55	50—51
1,875,892	,,	July 27	4½	4½%	Newcastle & Gatsh'dCon.	98½—99½	83½—84½	83
98,125	,,	,,	—	4%	Do. 4 p.c. Pref. Stk.	..	78½—79½	...
129,705	,,	Dec. 29	3½	3½%	Do. 3½ p.c. Deb.	82—83	68—69	...
15,000	10	Aug. 26	—	7/6	North Middlesex 10 p.c.	..	..	...
55,940	10	Aug. 24	7/14/0	7/8⅜	,, ,, 7 p.c.	14—15	10½—11½	...
300,000	Stk.	Nov. 30	8	8%	Oriental, Ltd.	117—122	95—100	97½—98
188,120	Stk.	Dec. 29	—	72/6	Plym'th & Stonh'se 5 p.c.	..	94—99	...
60,000	50	Aug. 24	13	65/-	Portsea Island, B	128—131	100—105	...
100,000	50	,,	12	60/-	Do. C	118—121	97—102	99½
249,980	5	—	8	—	Primitiva Ord.	5½—6	⅜—½	13/—14/-
499,960	5	—	5	—	Do. 5 p.c. Pref.	4½—5	2 1/16—2 1/8	49/—52/-
521,600	100	Nov. 30	4	4%	Do. 4 p.c. Deb.	91—93	68—73	...
600,000	Stk.	Jan. 25	4	4%	Do. ,, ,, 1911	..	55—60	...
346,198	,,	Dec. 29	4	4%	River Plate 4 p.c. Deb.	85—87	53—58	...
150,000	10	Sept. 21	6	6/-	San Paulo { 6 p.c. Pref.	10½—11	5⅜—6⅛	...
125,000	50	July 3	5	5%	San Paulo { 5 p.c. Deb.	47—49	35—38	37—38
135,000	Stk.	Aug. 24	10	5%	Sheffield A	223—224	97—99	97½
209,984	,,	,,	10	5%	Do. B	222—224	97—99	...
523,500	,,	,,	10	5%	Do. C	220—222	97—99	...
133,201	Stk.	Sept. 15	4	4%	Shrewsbury 5 p.c.	..	..	...
90,000	10	Nov. 2	9	7%	South African	10½—11½	7—9	...
6,609,895	Stk.	July 27	5/4/0	5%	South Met. Ord.	111—113	94—96	94⅜—95⅛
250,000	,,	Jan. 11	—	5%	Do. Red. Pref.	..	94—96	...
1,895,445	,,	,,	3	3%	Do. 3 p.c. Deb.	72½—74½	59—62	59½
734,000	,,	Sept. 7	—	6½%	Do. 6½ p.c. Deb.	..	105—107	105½
224,830	,,	Aug. 24	8½	8½%	South Shields Con. Stk.	157—159	108—110	...
1,087,795	,,	,,	6	6%	S'th Suburb'n Ord. 5 p.c.	114—116	99—102	100—101⅛
298,337	,,	Dec. 29	5	5%	Do. 5 p.c. Deb. Stk.	116—118	93—98	...
647,740	,,	Nov. 2	5	7%	Southampton Ord.	99—102	80—83	...
121,275	,,	Dec. 29	4	4%	Do. 4 p.c. Deb. Stk.	..	68—73	...
250,000	,,	Aug. 24	—	218	Swansea 7 p.c. Pref. Stk.	..	103—105	...
200,000	,,	Dec. 29	—	202	Do. 6½ p.c. Deb. Stk.	..	101—103	101½—102 5/16
120,000	,,	July 27	—	7½%	Tottenham { A 5 p.c.	135—138	112—117	116
782,275	,,	,,	6	6%	Tottenham { B 3½ p.c.	115—117	100—103	100½—101½
181,255	,,	Dec. 14	4	4%	Tottenham { 4 p.c. Deb.	87—89	75—80	...
236,476	Stk.	Aug. 24	5	2½%	Tynemouth 5 p.c. max.	108½—109	79—81	...
30,000	,,	July 27	8½	72/6	Wandsworth, Wimbledon, and Epsom—Wandsworth A 5 p.c.	151—156	111—115	...
155,636	,,	,,	6½	57/6	Do. B 3½ p.c.	129—134	100—105	102½
108,375	,,	,,	—	50/9	Do. C.	..	88—93	91½
140,865	,,	,,	—	50/9	New Ordinary	..	87—92	...
352,000	,,	,,	6½	53/9	Wimbledon 5 p.c.	117—122	95—100	...
98,000	,,	,,	6½	58/9	Epsom 5 p.c.	121—126	100—105	...
88,416	,,	Dec. 29	3	3%	3 p.c Deb. Stk.	66—69	56—59	...

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THE FLOW OF GASES and PROPORTIONING GAS MAINS.

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Another Reduction at Coatbridge.—As from the date of the last meter reading, the price of gas in Coatbridge has been reduced by 1·4d. per therm, making the present rate 7d. per therm. This is the third reduction made by the Coatbridge Gas Company since Jan. 1, 1922, totalling 3·8d. per therm. In addition, meter-rents have been discontinued.

Extensions at Birkenhead.—The Birkenhead Gas Committee have decided upon an amended proposal for the conversion of the whole of the retort-house to mechanical stoking at a cost of £47,849. The Town Council have agreed to the scheme, by the adoption of which a saving of £20,000 a year in the cost of gas production was foreshadowed by Mr. Luke Lees, the Chairman of the Gas Committee.

New Main and Holder Tanks at Birmingham.—In order to give adequate pressure in the Erdington and Sutton Districts of Birmingham, a new additional main, from the Nechells works, is approaching completion, and should be in use during next month. It is 36 in. at the initial end, 24 in. in the intermediate parts, and 18 in. terminal. The present main is 24 in. to the Birmingham boundary, and then there are two 16 in. mains to Sutton Coldfield. At Chester Road the pressure is reinforced by an electric boosting plant. The work was commenced in November. This week the excavation work was begun at Washwood Heath for the construction of the tanks for two gas-holders, each 254 ft. in diameter, with a depth of 45 ft. (about half the length being below). This job will probably take twelve months to carry out.

Bath Gas Light and Coke Company.—The Directors report with regret that, since the last annual meeting, they have lost the services through death of their friend and colleague, Mr. Albert Browning, who served on the Board for a period of thirty-one years, and was Chairman of the Company for twelve years. The vacancy thus caused has been filled by the election of Mr. J. H. Colmer, J.P. In April, 1922, the Board of Trade granted an Order under the Gas Regulation Act, 1920, enabling the Company to supply and charge for gas on the therm basis. The Company commenced working under the Order after the close of the June quarter, and the accounts for the last half year have been calculated and rendered on the therm basis. The Directors are pleased to state that the change-over to the new system has been accomplished without any inconvenience to consumers. During the year the Directors have made the following reductions in the price of gas: April 1, from 2s. 10d. to 2s. 8d. per 1000 c.ft.; Oct. 1, from 6·6d. per therm (2s. 8d. per 1000 c.ft.) to 6d. per therm (2s. 4·8d. per 1000 c.ft.). For the current quarter the price has again been reduced to 5½d. per therm (2s. 2·4d. per 1000 c.ft.). An interim maximum dividend of 5 p.ct. per annum, less income-tax, was paid in August last for the half year to June 30, and the Directors recommend a dividend at the same rate, less income-tax, for the half year ended Dec. 31.

City of Durham Gas Company.—A balance available of £3193, allowing for a dividend of 5 p.ct. on the original capital and 3½ p.ct. on additional capital, for the half year ended Dec. 31, was reported at the annual meeting of the City of Durham Gas Company. The report stated that, under a Board of Trade Order, which required the Company to sell gas on the therm basis, the maximum charge allowed in the city was 12·6d. per therm. The present charge was 9·5d., equal to 3s. 11½d. per 1000 c.ft., instead of 4s. charged before the change. The revenue account showed that £14,052 had been paid by consumers, and residual products had produced £8242. The Chairman (Mr. G. Chapman) said costs were coming down, chiefly on account of reductions in wages and coal prices. These prices were, however, still 65 p.ct. above those of 1914. A considerable saving had been effected in the cartage account, but residuals showed a decrease. There had been an increase in the quantity of gas sold. The report was adopted, and the dividends approved.

A recent fire at the premises of Messrs. B. Milnes and Son, paper merchants, Diamond Street, Bradford, was attributed to molten metal melting the gas service-pipe, igniting the gas, which set fire to a stock of paper. The gas was turned off, and the fire extinguished by buckets of water before the fire brigade arrived.

At the invitation of the Directors, the staff and employees of Burners (1921), Ltd., Stoke Prior Mills, Bromsgrove, had their annual dinner on the 19th ult., when about sixty sat down, including Messrs. C. Holmes Hunt, H. King Hiller, and J. S. Burgoyne (members of the Board). The function took the form of a very successful fancy dress carnival. Mr. Aulton, on behalf of the Welfare Committee and employees, thanked the Directors for their generosity, and pointed to the tremendous advance made by the Company during the last twelve months. He emphasized the fact that the "Efficient" series of burners and lamps now being manufactured by the Company filled a long-felt want, owing to their being designed to live-up to their name on any quality gas.

In an address to the Ramsgate Rotary Club last Wednesday, Mr. R. H. Ruthven (the local Gas Engineer and Manager) pointed out the lack of foundation for the fear which apparently was felt with regard to carbon monoxide. An odourless gas was in no case sent out—in fact, all gas supplied in the country had a pungent and instantly noticeable smell. Mr. Ruthven stated that gas fatalities represent only two deaths per million of the population of Great Britain. Far from being an injurious constituent, carbon monoxide is by its very nature most beneficial, for it burns with an intensely hot flame. It can therefore give a maximum of service in all operations depending upon the attainment of a high temperature—such, for example, as in the incandescent mantle.

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